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November 12th, 1943

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Editorial

The refusal of Economic Stabilization Director Vinson to grant the oil industry's request for 35-cent increase in the price of crude oil does not come as a surprise to the producing units on whom the burden of existing prices falls heaviest. The fact that the producers had decided to take the fight for higher prices to the public even before Judge Vinson made his long-delayed announcement shows that the Economic Stablization Director did exactly what it was feared he would do. The OPA had previously twice rejected the recommendation of Petroleum Administrator Ickes that crude prices be advanced.

Judge Vinson's arguments are as unimpressive as were those of the Price Administrator. Like Prentiss Brown he makes use of irrelevant material and completely ignores several pertinent factors which support the need for a price increase, but for which he apparently had no answer.

An aftermath of the decision is that the public appears singularly unimpressed by Judge Vinson's statement that to raise the price of crude oil would raise the price of gasoline and "to keep faith with the wage earners and others we must permit no increase in the price of gasoline." If his refusal to raise prices results in an increasing and dire shortage of gasoline, he is hardly keeping faith with the consumer, who, we believe, would rather pay a cent or even two cents a gallon more for gasoline than have his allotment further reduced, as it inevitably will be if the present trend of supply and demand continues.

While denying a general price increase Vinson directs the PAW to formulate a program to give additional financial incentives for wildcat drilling and "a program other than a general price increase to give additional financial support for marginal stripper well and secondary recovery operations." This means Government subsidies, OPA's socialistic alternative for raising crude prices. Industry opposition to these subsidy schemes has been voiced time and time again and they require no further comment here.

Reference to the Tariff Commission's out-of-date, poorly-prepared report on producing costs in Judge Vinson's statement added nothing to his argument. As one oil industry leader recently put it, the Tariff Commission report is a "boiler-house job" and ignores too many realities in the producing business to be of value. The report has been a favorite prop of the OPA in discussions of price matters; in fact, it was prepared in collaboration with the Office of Price Administration, whose interest, as everyone knows, is to keep prices down.

Congress now appears to be the sole hope of the oil producers for relief, since a reversal of the Economic Stablization Director's decision by War Mobilization Director Byrnes or the President appears very remote. Congressional attitude is problematical, but as the nation's extremely serious oil situation becomes more generally realized it may be that there will be an avalanche of favorable public opinion resulting in legislative action on oil prices. In fact, it would not be at all surprising to see the public carrying the ball for the industry.

If sympathetic Congressmen are looking for facts, California's oil picture is impressive evidence of the need for price adjustments as a means of further stimulating oil field activity. The recently issued statistical statement for September of the U. S. Bureau of Mines reveals a new peak oil demand for that month which is just shy of one million barrels a day—as against an overall demand in the Pacific Coast territory of about 675,000 barrels daily at the outset of the war. Demand has far outstripped supply, with the result that immense withdrawals from storage are occurring, the draft of 4,439,000 barrels in the month of September being the largest in the history of the California oil industry. August and September, combined, saw withdrawals of nearly 9,000,000 barrels which is over 50 per cent of the total withdrawals in 1943 to date.

It is perfectly obvious that this trend cannot long continue and that even today the rising tempo of the war in the Pacific poses an extremely serious problem of supply. It has been pointed out that to meet a deficit it should be possible to draw on other oil sources, notably Caribbean production, for our Pacific operations. The success of an import program from that area, as Deputy Petroleum Administrator Davies said the other day, is however dependent on our ability to develop productive capacity of the types of crude oil required and in the time and to the extent necessary. A major factor also, as Mr. Davies pointed out, is the availability of tankers and the safety of the sea lanes.

No substitute stimulus exists that would be as effective in increasing the nation's oil supply as the establishment of a fair price for crude. Nevertheless, the oil industry will continue to make every possible effort to supply military and essential civilian requirements, regardless of the conditions now imposed upon it. The irony of it is that should it, through no fault of its own, be unable to meet these requirements in the smallest measure, it will be the object of recriminations from the very Washington element responsible for the handicaps under which it is now compelled to operate.

NUMBER 6 OF A SERIES

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Reports From Washington

California's hopes for an added stimulus for badly-needed expansion of drilling operations; increased wildcatting; a comprehensive program for secondary recovery, and numerous other ventures which require cash-on-the-line, went down the drain, Oct. 29, when Economics Stabilization Director Fred M. Vinson pulled the plug on the projected 35-cents-per-barrel increase for crude oil.

Marking the end of a long battle for a general increase in crude prices—unless Petroleum Administrator Ickes can make an end-run around the Hold-the-Line Forces which seem to block the entrance to the White House—Vinson's ultimatum put an effective check on the national petroleum industry's urge to produce to the utmost for the war effort.

While some experts had predicted a possible "compromise" (say 20-cents-per-barrel) from Vinson's office, the flat turn-down was not exactly a surprise. The recent cavortings that the former Kentucky Congressman has indulged in with the railroad labor problem—resulting in an imminent strike threat and the loss of railroad labor's vote for President Roosevelt's reelection—was warning enough to many oil men that only the worst could be expected.

Space does not permit a detailed airing of the Vinson vs. Price/Increase issue. Perhaps it can be summed up in the words of an embittered railroad labor representative whose plea for a wage increase enabling the road to continue functioning was turned down:

"He doesn't know anything about transportation and, furthermore, he doesn't give a damn."

The recent rejection of the 35-cent crude price increase proposal tipped over a likely scheme to develop California's latent oil possibilities. Less than 24 hours before the announcement, your correspondent emerged from the office of Don R. Knowlton, director of the Production Division of the Petroleum Administration for War, with some interesting figures on how to add to California production by secondary production methods.

Old fields, such as Coalinga, Midway Sunset and Richfield, may hold the secret to badly-needed additional production for the war effort, Knowlton indicated. But the possibilities for expansion would depend "on the amount of money received for the oil produced."

While Knowlton had no figures handy on California's present production by water-flooding, or air and gas repressuring, he estimated U. S. daily production through secondary recovery measures at 100,000 barrels. Assuming total reserves of the country at 100,000,000,000 barrels—with 27,000,000,000 barrels already produced; 20,000,000,000 barrels available through normal methods of production, and 53,000,000,000 barrels classified as unrecoverable by primary drilling methods and left in the ground—the production expert made a conservative estimate—of 5% as the probable contribution of a well-conducted secondary recovery drilling campaign.

Engineers approximate normal recovery at from 30 to 50% he explained, and assuming the present status to be 47%, there would be 53,000,000,000 barrels left for science to experiment with. Taking 5% as the share of oil that might easily be recovered by modern repressuring methods, a production of 2,650,000,000 barrels could be looked forward to from this source, Knowlton told California Oil World.

"When you think of how many wildcat wells (15,000) would have to be drilled to recover 2,000,000,000 barrels, and when you consider the lesser risk of using secondary recovery methods—where something already is known about the formation—, the use of these methods appears sensible", he said. "Also, the wells can be shallower, in most instances."

However, Knowlton's hopes of a sizable program in California—where the matter is already under study by a subcommittee of the District 5 Production Committee, headed by Cy Rubel of Union Oil Co.—were based on the now—denied price increase. A 20-cent increase would not help much, he agreed, but a 50-cent increase would "maybe treble" the country's program for drilling of this type. As a specific instance, Knowlton called attention to the input water well which Union is using as an experimental "pilot flood" in the Richfield field.

What can be done now for a reversal of the Vinson opinion? Well, oil-minded members of Congress are threatening to tack a rider on "some bill the Administration wants" to push through an increase in crude prices and skirt the almost inevitable veto the President would slap on any solitary measure containing such a proposal. Add those Congressmen who have other grudges against Vinson for his high-handed treatment of their labor constitutents and the very considerable group of lawmakers who are thoroughly fed-up with the policies of Vinson and the Office of Price Administration, and you have a formidable array of price-boosters. Also, its no secret that Congress is committed to a definite stand against "subsidies"—which Vinson proposes as one sop for the price turn-down.

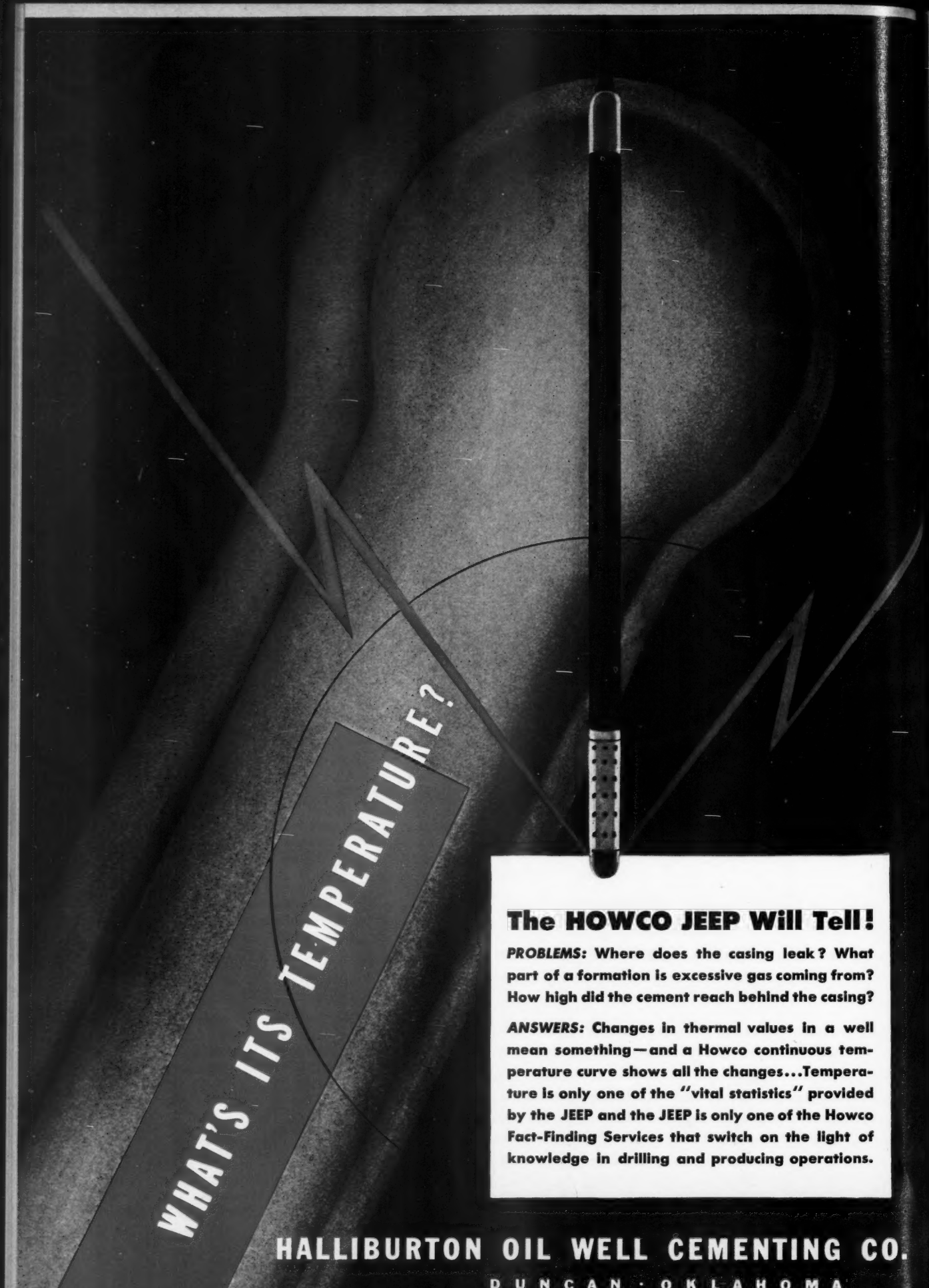
. . . Just as we finished that paragraph, the PAW came out with a rejoinder to the Vinson remarks which reiterated their stand of many months. In a letter dated Nov. 4, Ickes told Vinson:

PETROLEUM ADMINISTRATION FOR WAR

Washington 25, D. C., November 4, 1943.

My dear Judge Vinson:

I wish to acknowledge the receipt of the statement of your decision upon my recommendation on crude oil prices which I first made to the Price Administrator on April 7, renewed on June 10, and finally submitted to you on August 9. Naturally, this is disappointing to me; I only hope that it will not prove discouraging in the industry to the point of restricting development at a time when we so greatly need a stimu-



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lated activity as acknowledged by all who have studied the oil problem, including yourself.

In my first communication to the Price Administrator, I stated:

> "My views, of course, represent my judgment on the oil situation only. Having weighed these views, you or the Director of Economic Stabilization may deem the risk of an oil shortage less grave than the risk of other possible effects upon the Nation's economic structure. If so, under your statutory powers, that is clearly a decision that you, not I, should make."

From the standpoint of oil supply, which is my responsibility, your statement does not alter at all my conclusion as to the necessity for an upward adjustment in oil prices and I am sure that you did not expect it to do so.

I do appreciate the manner in which you have recognized that during the lengthy period while this price question has been under consideration, both my office and the petroleum industry have aggressively pursued and continue to pursue such means as lie within our power to augment our petroleum supplies. As you yourself indicated, these have already included, among others, the increasing use of our small remaining additional crude oil capacity, particularly in West Texas, by providing necessary transportation facilities, increasing the use of foreign oils as far as the tanker situation and foreign refining capacities permit, and a relaxation of spacing requirements in existing oil field as rapidly as additional drilling materials become available and wherever such additional drilling will actually provide more oil rather than merely more holes in the ground.

The ultimate objective of our efforts is, as you know, not alone to provide for all military demands and the present restricted civilian rations of gasoline and oils, but, if possible, to eliminate eventually the necessity for restrictions upon civilian use and to protect adequately and in the broadest sense the oil future of the country. That objective springs from our concern for the future welfare of the same "unnumbered millions of wage earners, producers, and merchants" of whom you speak. Aside from military considerations, an increase in price to stimulate production is only justified, of course, if it returns full value to the American public. I have been convinced, and remain convinced, that the price increase recommended would so return full value.

We have already stated our conviction that, in the absence of any tested or tried alternative, a general price increase would be the most practical and best financial device for minimizing the risks of crude oil shortages in this country. No subsidy plan or proposal yet developed has met even your very general tests of simplicity and the avoidance of impossible administrative burdens, on the one hand, or the dangers of grave misuse of public funds on the other. However, at the forthcoming meeting of the Petroleum Industry War Council I shall ask that body for its coorporation in further attempting to determine what plan or program, if any, other than a general price increase, might be designed within the general limits that you have prescribed.

I trust that you recognize that under any subsidy plan the inherently speculative character of the whole business of finding and producing oil would compel public rather than private funds to be gambled upon what your decision calls "prospector's luck." I only hope that if this should be done, the Congress and the people would remember, after the moneys were spent, that wildcats are usually dry and only seldom successful, and that losses, not profits, are to be expected.

While I receive your decision in the spirit in which I know that it was rendered, the problem, as such, remains unsolved. We cannot, therefore, be at rest on the present basis and you will hear further from me.

Sincerely yours,
/s/ HAROLD L. ICKES
Petroleum Administrator for War.

The adamant stand of the PAW against all wish-thinking that would fill up the tanks of America's civilian motorists and still leave enough for our ever-increasing military demands for motor fuel, 100 octane and other petroleum products, remained intact this month when Davies again told a Congressional committee that the thirsty war-machine of the United States and its Allies would require every drop obtainable,—even in the face of a possible 200,000 B/D additional production from West Texas and an "appreciable amount" of petroleum imported from South America.

Before the special petroleum subcommittee of the House Interstate Commerce Committee, Davies testified that:

Military estimates indicate "all production" in the U. S. will be required to keep wartime and civilian requirements fulfilled,—even though completion of the 20-inch pipeline to the East, additional tank cars for the removal of Texas sour crude from the West Texas fields and increased tanker service from South America augment our present supplies.

The Canol project in Alaska—widely advertised by Army tub-thumpers but frowned on by most commercial oil concerns as impracticable—was called a "questionable" proposition and one that Davies felt should be stopped in its tracks. (After the war, he told the committee, he did not see that "the United States would be the logical area" to use oil produced from the contested Alaska territory.)

It would be "nothing short of bad faith",—if the major oil companies did not conform to their stated policies on a crude price increase,—namely, that profits accruing to the big companies from such an increase should be poured into exploratory drilling he said. The "tax factor" also has to be considered, Davies pointed out, in an effort to convince the committee that, in many cases, new profits arising from a 35c per barrel increase in crude prices would "be returned to the Government".

The thought that profits of the major producers, from any increase in prices might be turned to exploratory drilling appeared to impress Representative Clarence Brown (R., Ohio), who asked Davies if this possibility had been "brought to Vinson's (Economic Stablization Director) attention. Davies replied that it had. Congressman Brown considered this point "very important",—explaining that he felt few of the members of Congress understood the unwritten understanding between PAW and the oil industry on this question.

The exceedingly-touchy subject of a possible "foreign oil policy" of the U. S. was brought up by Brown and adeptly handled by the former Standard of California vice-president. Asked whether this country today had " any foreign oil policy", Davies replied that this was a question for our State Department

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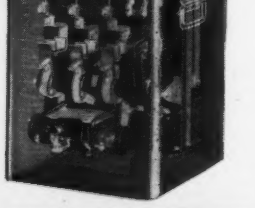

GE CONTROL

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to answer. When asked for a more specific reply, Davies simply pointed out that "our Government, in the past, has not supported its nationals abroad as Great Britain has." (The committee appeared satisfied with this reply, and nodded wisely.)

This, perhaps, is a cue to something broad and startling that may be expected within the very near future from the relatively—new and very hush-hush Government agency,—Petroleum Reserves Corp. This outfit first attracted attention when it appeared as one of the numerous god-children of Jesse H. Jones,—before Mr. Jones' abrupt removal as guardian for numerous Federal lending and purchasing agencies. PRC is now in the able hands of Administrator Ickes,—but there are no indications, so far, that it does not represent a breath-taking swing toward the British 50-50 working policy between Government and the oil industry.

Briefly, Petroleum Reserves Corp. is a long step toward Government intervention into the affairs of U. S. oil companies with holdings outside this country. It is a post-war, global proposition that involves things that can't be talked about at the moment. It will involve our major allies, in this war. . . . It is headed straight for the Near East.

Watch for developments a-plenty on this matter. Standard Oil Co. of California and The Texas Co. are implicated (somewhat unwillingly, according to our grapevine). . . So is California of Arabia. . . . The industry, as a whole, may not take kindly to the theory it should split with Government on its foreign holdings, in order to insure a plentiful supply of oil and refined products for the day when U. S. oil reserves will be running low.

On the other hand, there are definite indications that the Government is ready to forge ahead on a pretty well-defined program of its own, if American companies with foreign holdings refuse to play ball. Some of our leading economists have been studying the British system, where Government has mothered private interprise in the "colonies" with exceedingly good results. . . . Just watch, and see.

Prentiss Brown, director of the Office of Price Administration, quit since our last issue. He was succeeded by Chester Bowles. . . . As long as OPA continues to be run by "the boys in the back room", this should make little difference to anyone.

While no real blow-off on the Elk Hills (Standard of California—Navy Department) matter has occurred, at this writing, storm signals were flown, Oct. 28, in a speech by H. Jerry Voorhis, Congressman from San Dimas, who demurred at the possibility of turning over "the Navy's oil reserves" the Standard's "operation and control". . . . This is typical of the attitude of Congress toward a matter that nobody has taken trouble to really investigate. Congress still is worrying about "locking in the ground" oil that will be vitally needed within the next few months for a successful prosecution of the war.

When the House Naval Affairs committee takes the ball away from the House Public Lands committee and carries on the "investigation" of the Elk Hills contract from where it was dropped last summer, it may be possible to get some real witnesses on the stand. Cracks about a "second Teapot Dome" are as silly as they are unwarranted . . . except they make headlines for headline-hunters. The important point is how long the Government is going to keep shying away from the really important fact,—to wit: that oil underlying the disputed area in the Elk Hills reserve is going to be desperately needed for the war effort.

We have only contempt for recent criticisms of the PAW, on the grounds that it is riddled by "big company" officials who are protecting their own interests at the expense of the little fellow. The "big" and "little" companies seem pretty well in accord on all of the oil iindustry's major problems,—so much so that we will not consume further space in quoting figures given the Lea committee by Ralph Davies on the preponderance of "minor" company representatives, as against "major" company representatives, in the present Government-industry set-up. Any differences between the "majors" and the "minors" on the necessity for a better-coordinated program on matters affecting the petroleum industry are so small as to warrant very little attention from the public,—let alone Congress.

Again in the interest of newsprint conservation, we recommend a careful study of the outcome of the scheduled "wartime" meeting of the API and the PIWC, at Chicago, for proof that the most individual and independent "big" industry of the United States can take a united stand on subjects that normally would split a competitive enterprise into several factions. . . . The industry, large and small, has presented a solid front to a public which sorely misunderstands its problems, throughout a period which has proved almost disasterous to some of its members.

For once, Radio Tokyo was almost right

The first time it happened was in the Solomons. Thirty-six Jap bombers left their base to attack one American battleship. *None* came back. Radio Tokyo whimpered that the warship evidently carried "six-inch machine guns" . . . and for once they were almost right.

For the Navy's new twin mount, five-inch gun, whipping gracefully 'round its cradle, lashes out every five seconds . . . lashes out and pulverizes, leaving no survivors and no cripples. It's more than anti-aircraft. It's aircraft *hunting*.

Consolidated Steel Corporation manufactures this weapon under contract to the Navy Department. Working to precision tolerances of 2/10,000 of an inch, volume production is today *seventeen months ahead of schedule*—a record that has won for the men and women of Consolidated every basic government industrial award.

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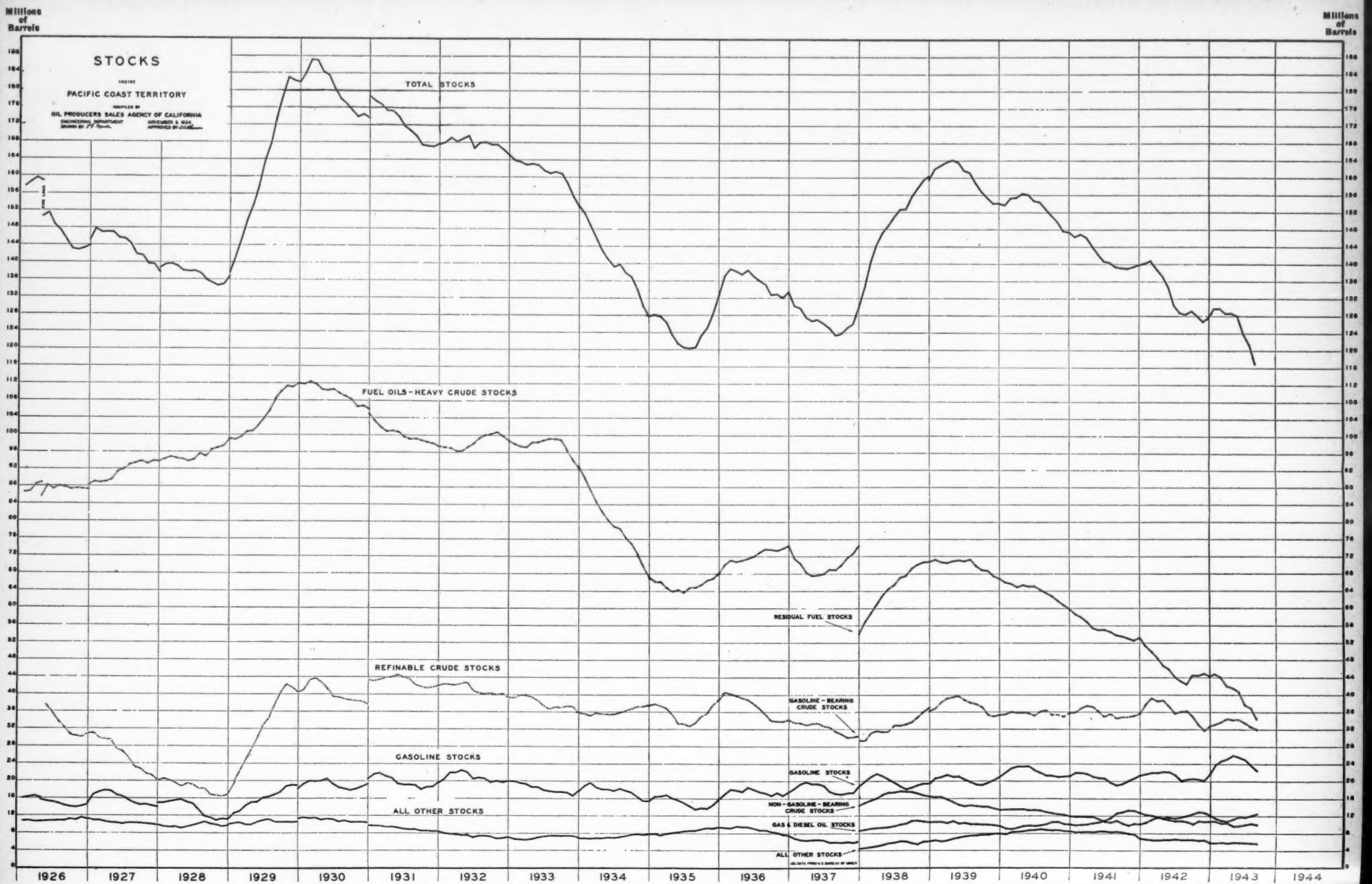

In sending California Oil World the attached Stock Chart, Mr. Rush M. Blodgett, Executive Vice-President of the Oil Producers Agency of California, states:

"You will note that our stocks above ground have dropped to a low level. In view of the military demand, you can see that at the rate of withdrawals, the supply in storage will not last long. In inspecting the chart, please bear in mind that a large portion of the stocks are not

Gun Perforating For Multi-Zone Control in California

T. H. Wallace, Superintendent
Western Gulf Oil Company
Bakersfield, California

The use of gun perforating as discussed herein is not an endeavor to sell gun perforating to the oil industry as the only method of completing a well or to advance it as a "cure all" for the many and varied problems encountered in completing and placing a well on production. It is rather, a discussion of the use of gun perforating as another "tool" or method used more successfully in coping with the particular problems outlined later than methods which had been used previously. It is entirely possible the use of gun perforating as discussed may be improved upon or will not be the solution to the problems met in each and every field.

In the past, the method of gun perforating was assumed to be something more or less standard and the results accomplished, good or bad, accepted as a matter of course; that is, casing would be cemented through known sands, either because of anticipated deeper production or with the idea of testing one or more zones selectively. The casing opposite the known productive intervals would be gun perforated with one, two, or three holes per foot, of diameters more or less selected at random, and the well placed upon production. If the well produced 5 or 50 barrels that was it. If the production was as anticipated nothing was thought of it and if it was below normal it was because of the gun perforating. No attempt was made to analyze the situation as to whether a sufficient number of holes had been shot per foot or whether the holes were of the correct diameter and spacing. As a consequence whenever gun perforating was considered successful jobs were minimized and the less successful jobs remembered with the result that gun perforating came to be used only in cases of necessity or last resort.

In place of following this line of thought it was decided to assume when gun perforating casing opposite a known productive sand that if the proper number of holes per foot were used of the proper diameter and spacing and all other factors being equal, the results attained by gun perforating should be comparable to those which would have been attained by running a conventional slotted liner, since, the prinicpal physical difference was only that in one case there would be round holes as compared to rectangular slots in the other. On this basis then why should not comparable rates of production be established using either method of well completion?

This line of reasoning was prompted by the problem at hand. How to re-work and deepen a large number of old wells in addition to completing new wells through 800 to 1,200 feet of section, having 500 to 600 feet of net productive sand thickness, divided into six principal zones with intermediate shale streaks, making it possible to isolate the individual sand members from the rest of the zone or zones for present and

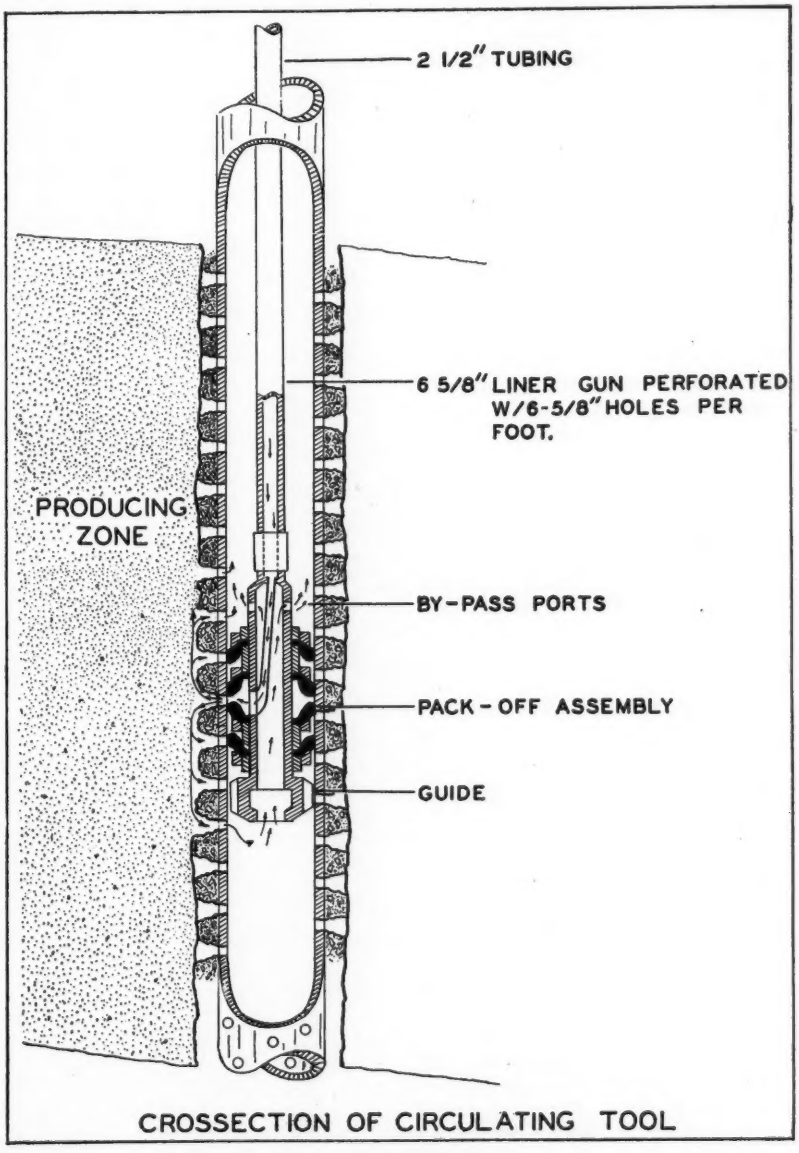

FIGURE NO. 1
(WALLACE)

In sending California Oil World the attached Stock Chart, Mr. Rush M. Blodgett, Executive Vice-President of the Oil Producers Agency of California, states:
"You will note that our stocks above ground have dropped to a low level. In view of the military demand, you can see that at the rate of withdrawals the supply in storage will not last long. Unless there is a change in the situation, we will be unable to meet the demand."
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What are you going to do about engines in 1944

● This is an all-out war! It's being fought on two fronts—the battle line overseas—and the production line at home. Waukesha is right in there fighting—100 per cent—on both fronts.

● Oil is ammunition! That's your sector on the battle lines—and Waukesha's. And, unless we pull together, the battle won't be won.

● This means, briefly—that you and other oil field engine users must tell us *approximately how many* Waukesha Oil Field Engines you'll need in 1944—and when you want them. If you can't place an order—at least estimate your future needs.

● On the basis of your orders and estimated needs for 1944, Waukesha will plan its production schedule.

● Will you give us this vital-to-victory information *now?*

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future water control over the respective sand members? In the past, at various times, the cementing of blank sections of pipe between slotted sections of liner had been attempted without too much success in getting anything cemented in place except the perforated intervals and in one case the cementing tools. However, even had these jobs turned out 100 per cent successful it would have been impractical if not impossible to cement sufficient blank sections to obtain the control desired because of the many sand members and the small thickness of certain shale bodies.

It was decided finally to drill one well through several horizons, cement a solid liner in place, and test the sand members individually from the bottom up by gun perforating. The bottom zone of the well selected was gun perforated and the well placed on production. The well was swabbed practically dry with a fluid entry of only 5 to 10 barrels a day.

Rather than continue any additional tests on this zone on which there was no production history from adjacent wells, it was decided to set a bridge plug above the interval perforated and perforate opposite a higher sand interval which was open to production in the near by wells completed in the conventional manner with slotted liners. This was done using 300, ¾-inch holes, spaced four holes per foot. The well was again placed on production and again the well was swabbed dry. The perforated interval was then pressure washed twice in the conventional manner and the well placed back on production pumping approximately 10 barrels a day, while other wells completed in the same zone using slotted liners were producing about 100 barrels a day.

It was decided that considerable infiltration of drilling fluid into the sand, followed by a certain amount of cement while cementing the liner in place, had set up a "jell" condition in the vicinity of the well bore and that the conventional perforation washer, operating on a relatively short stroke of the tubing to build-up pressure, did not have the fluid capacity to follow through effectively and break down this condition.

As an experiment, an opposed swab assembly or circulating mandrel, see Figure 1, with the opposed swab cups placed as close to each other as possible. approximately eight inches apart, was run. High pressure pumping equipment, rented from an oil well cementing company, was used to build up the required fluid pressure to break circulation between shot holes outside the liner and to pump the fluid volume desired for washing.

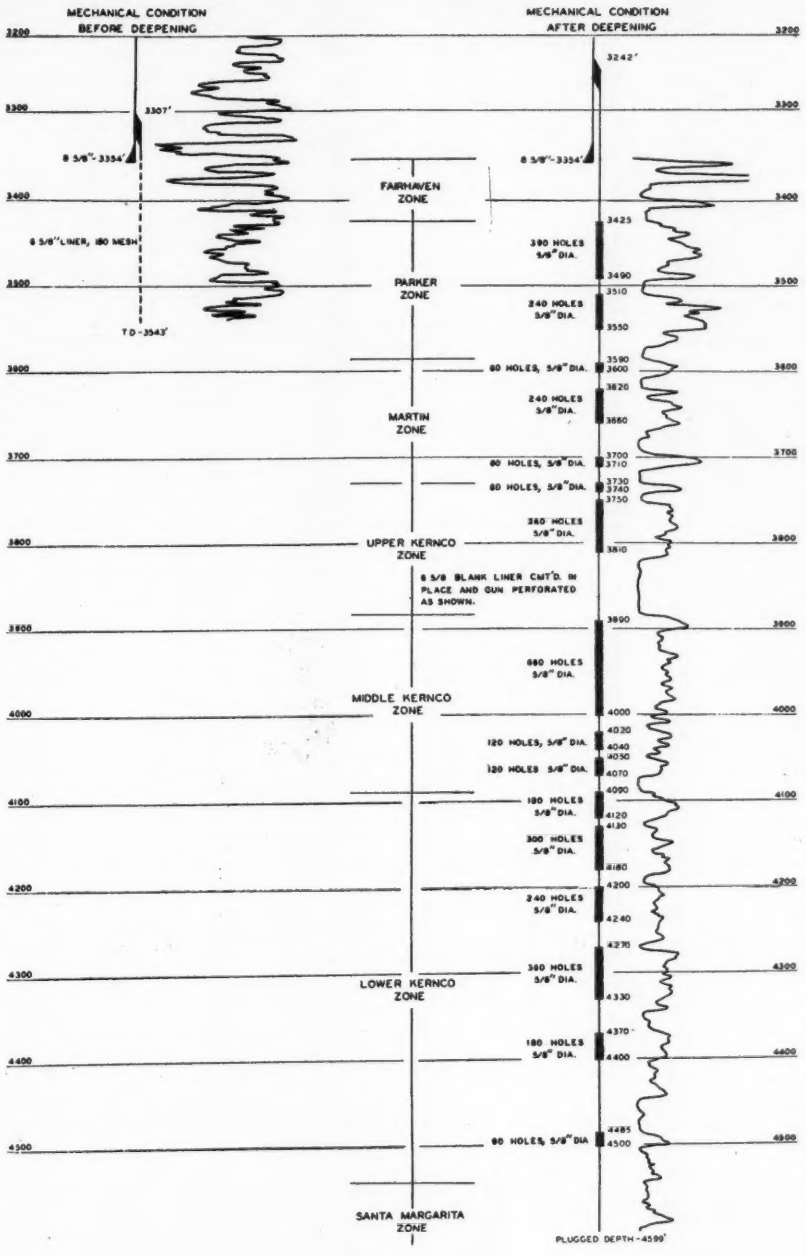
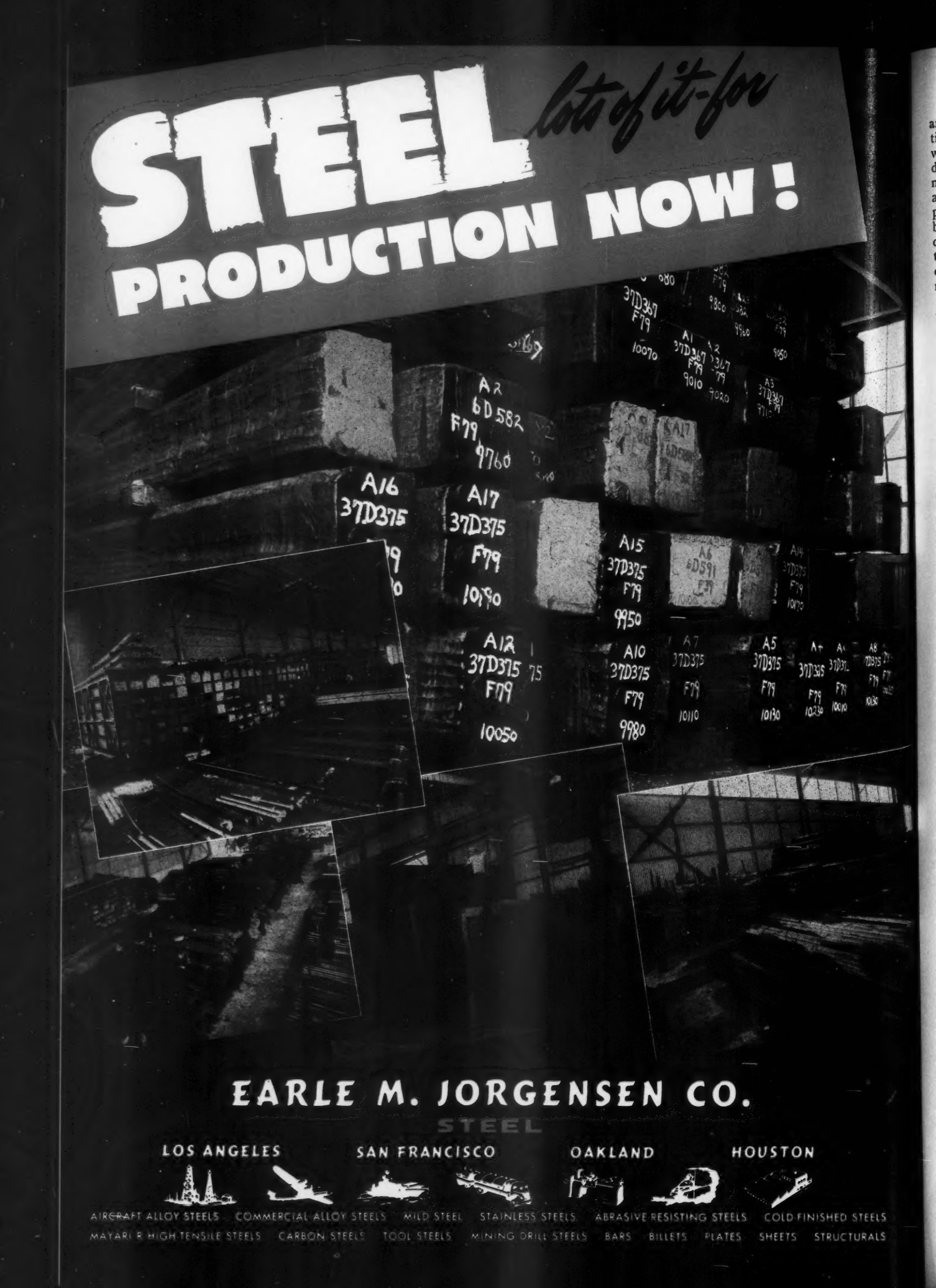


FIGURE NO. 2

Oil was used as the circulating fluid and after pumping away 15 or 20 barrels at 1,700 pounds pressure circulation was gradually established and the pressure dropped to 350 pounds. The whole perforated interval was washed in this manner at the rate of twelve to fifteen feet an hour. Before completing the washing, the returned fluid began to show some gas and the volume of the fluid returns was greater than the volume of the fluid being circulated indicating that the formation was contributing. The circulating mandrel was then pulled, the tubing, pump and rods run and the well placed on production. The well produced at a rate of 150 barrels of clean oil a day for ten days before sanding up. The well was again pulled, sand bailed, and the perforations rewashed as described previously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and the well again, placed on production. Since then, August 1942, the well has produced continuously producing a total of 42,350 barrels of net oil as of October 1, 1943 or an average of 105 barrels a day. At present the well is producing 100 barrels of net oil a day with 5 per cent water which is comparable to the production of adjacent wells completed in the traditional manner.

To emphasize the point made previously as to accepting results after gun perforating as final, the history of another well will be outlined briefly.

The particular well in question was plugged back after a test of deeper formations for possible production had been made. During the test, 7-inch casing had been run and cemented through three productive sand intervals. These intervals were finally opened to production by gun perforating through the casing, using ⅜-inch diameter shots, spaced on three inch centers over a 50 foot interval. Since the original completion in August 1940 to September 1942, the maximum production that had been attained was approximately 15 barrels a day which had been taken for granted. During this period the well produced a total of only 9,947 barrels of net oil.

In September 1942, after the success in the well discussed previously, it was decided to reperforate the interval already open to production and 70 feet more with an additional 480, ⅝-inch diameter shots on three inch centers. The well was washed thoroughly as heretofore described and placed on the pump during the latter part of September 1942. Since then to October 1, 1943, the well has produced a total of 28,118 barrels of net oil, or an average of better than 75 barrels daily. On the basis of the performance of the well prior to reperforating, it would have been expected that the production increase would have been proportional to the amount of additional interval perforated or approximately 18 barrels a day, or a total production of 30 barrels a day from the well. The actual increase was 150 per cent greater than would have been expected for the additional interval perforated and the overall production of the well was increased 600 per cent.

The procedure now followed in completing redrilled and new wells is to core all doubtful sand intervals to determine the limits of oil saturation. After the total depth is reached an electrical log is made for correlation purposes, sand count, and permeability indications. A blank liner is run to bottom and cemented in place. A water shut-off test is made generally through four shot holes immediately above the first sand that is to be opened for production. The drilling fluid is then displaced from the well with oil and the various zones or sand intervals are gun perforated. The well is then thoroughly washed and placed on production.

To date, in one field, a total of 18 wells have been worked over and deepened in this manner with an increase of approximately 1300 barrels of net oil a day. Six new wells have been drilled and completed in the same manner for a total of 500 barrels of net oil a day. Results so far obtained seem to indicate that after the well has been developed satisfactorily, that less trouble is given from running sand or plugging of the liner, resulting in fewer wash and bailing jobs to maintain production; also with very few exceptions no trouble due to water breaking in has been experienced.

A typical completion by gun perforating for a redrilled well is shown on Figure No. 2. The well was completed originally at a depth of 3543 feet, using slotted liner as shown on the left of Figure No. 2. The production prior to deepening was 36 barrels of net oil and 136 barrels of water, 80 per cent cut, daily. In September 1943, the well was deepened 1050 feet to a depth of 4599 feet. A 6⅝-inch blank liner was cemented in place through the productive section and lapped into the 8⅝-inch casing. The blank liner was gun perforated opposite sixteen different productive sand intervals, comprising a total of 610 feet with 3660, ⅝-inch diameter shots, six shots per foot, as shown to the right of Figure No. 2 After a months production the well is now producing 130 barrels of net oil a day and 5 per cent water.

It will be noted on Figure No. 2, the top perforated interval is opposite a sand section open originally to the well and that the source of water prior to deepening has been cased off effectively. It will be noted also that the un-perforated blank pipe between the sixteen intervals open to production offers complete control over any future water trouble which may develop from any source.

This method of completion has been used successively in several wells over 7000 feet in depth with an effective saving of casing, while at the same time maintaining the inside diameter of the well equal to or greater than if larger casing were used and a liner run. The original program in these wells was to complete a well using 7-inch casing with a 4¾-inch slotted liner landed through the producing zone. As a test, in one well, the 7-inch casing was set through the producing section and gun perforated after making the required water shut-off test. The productive capacity of the well, as nearly as could be determined from subsurface pressures and other data, was comparable to that of the wells completed in the normal manner.

In the next well and subsequent wells, instead of using 7-inch casing, a full string of 5½-inch casing was run and cemented through the producing section and gun perforated. The tubing size was reduced from 2½-inch to 2-inch and the surface pipe reduced from 13⅜-inch to 10¾-inch. The hole size was also reduced from 11-inch to 9⅝-inch. The reduction in pipe sizes represented a saving of nearly 45 tons of steel per per well. No appreciable difference could be noticed in the productive capacity of the wells completed with 5½-inch casing and those completed with 7-inch casing.

In concluding this discussion it is wished to emphasize again that gun perforating may not be the answer to the problems in each particular field or may not be considered necessary in single zone completions. It is believed, however, the merits of gun perforating for intermediate zonal control in multi-zone fields are recognized generally but that certain objectionable features attributed to this method of well completion have prevented its use as a standard procedure. It is hoped by this discussion that new ideas have been presented on the matter which will lead to other suggestions or possibilities for completing wells in the most efficient and economical manner possible.

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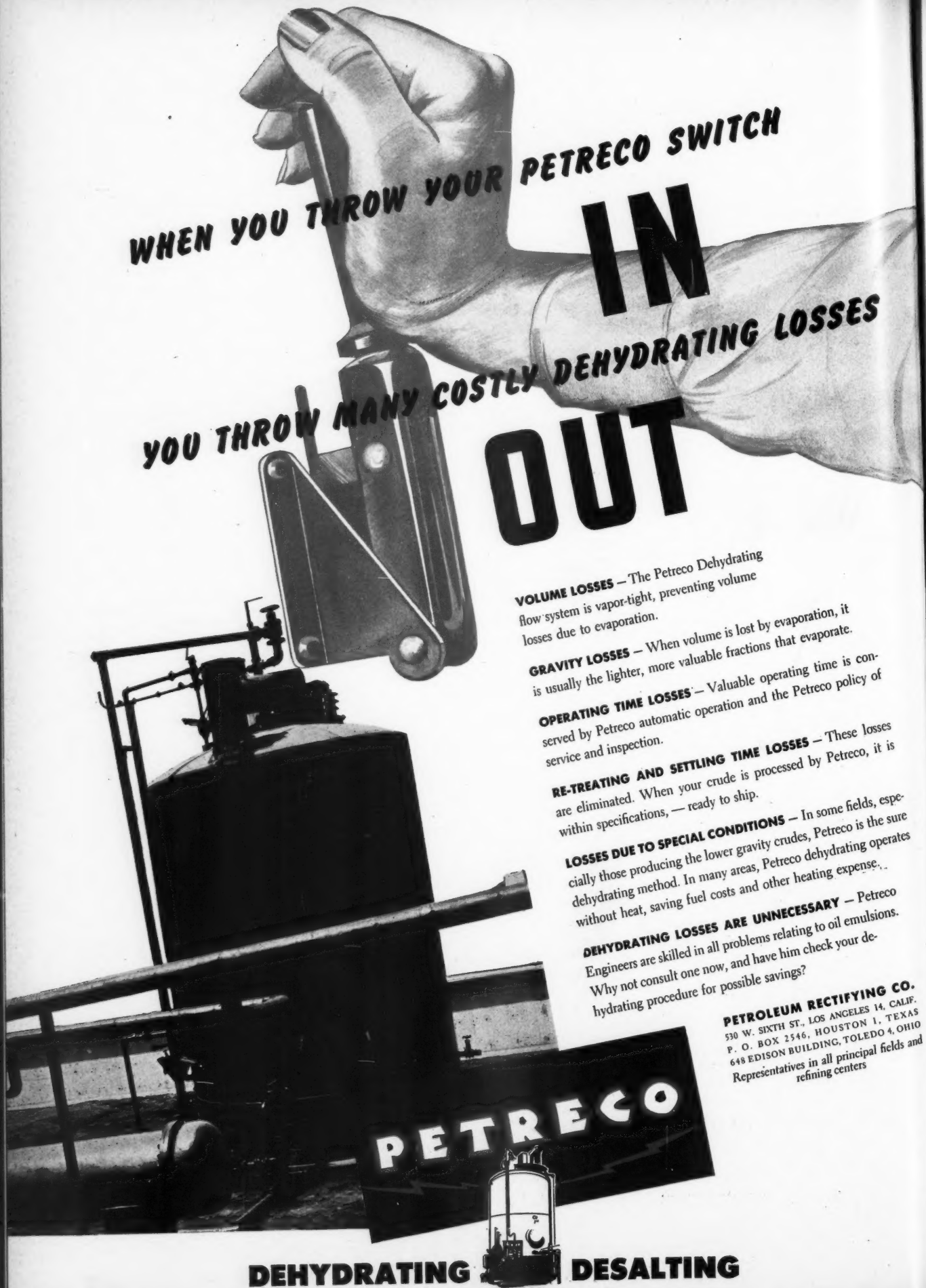

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Possible Application of Secondary Recovery Methods in California

By
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Petroleum Production Analyst
P. A. W. District 5

Abstract

It is estimated that thirty billion barrels of residual oil will remain in existing California oil fields after primary recovery. It is indicated that two-thirds of this residual oil is in fields where conditions are probably unfavorable for the application of established secondary recovery methods. The remaining fields, containing an estimated ten billion barrels of residual oil, warrant thorough exploration of the possibilities of secondary recovery, and this can be done only by actual experimental secondary recovery projects including extensive preliminary core analyses essential to such projects.

Graphic data show the principal factors affecting secondary recovery operations in eastern and mid-continent fields, compared with the corresponding factors in California fields.

Introduction

Secondary recovery as used herein will be limited to water flooding and air-gas drive, as these methods are applied in the eastern and mid-continent oil fields of the United States.

The theory and application of these secondary recovery methods are adequately discussed in recent publications of the American Petroleum Institute[1], the American Association of Petroleum Geologists[2], and the Petroleum Division of A.I.M.E.[3] Therefore, the present discussion will be limited to the possible application of the established secondary recovery methods in California, without further discussion of theory or description of operating projects in other areas.

Physical and Economic Factors

There are many factors having an important bearing upon the application of secondary recovery. The relative importance of these factors varies to some extent in different areas, and cannot be stated with assurance in California fields due to lack of secondary recovery projects in this State. Therefore, the following discussion of some of the factors affecting secondary recovery does not necessarily reflect their comparative importance in California.

Depth: As in primary recovery, depth is a controlling factor in the recovery of secondary reserves. It is the principal element in secondary development costs, and it also affects operating costs. The number and spacing of injection and production wells is limited by depth considerations, and the maximum injection pressures which can be used in water flooding is a function of depth.

Gravity: The crude oil gravity is always readily available, and although it apparently has very little direct bearing on secondary recovery operations, it is an approximate indication of the reservoir viscosity of the residual oil, and is therefore important for comparative purposes in preliminary investigations.

Porosity: Secondary recovery involves the displacement and exchange of fluids in the reservoir, and therefore porosity is important as a measure of the total fluid capacity of the reservoir. This pore space is filled with oil, gas and interstitial water, and the amount and distribution of each of these fluids throughout the pore space is of the greatest significance.

Saturation: The residual oil saturation of the formation at the time secondary recovery is applied, is of paramount importance, and it is frequently the deciding factor determining the economic success of a project. For this reason every effort is made to determine the oil saturation by core analysis prior to the application of secondary recovery. The residual oil saturation is usually expressed as a percentage of the total pore space. It it well recognized that even after the most efficient secondary recovery method has been applied, there will remain a final residue of unrecoverable oil approximating 10 to 30 per cent of the pore space. Therefore, the recoverable residual oil is represented by the difference between the residual saturation prior to secondary recovery and this final saturation after secondary recovery.

Recovery: Although other factors are used, the most significant recovery factor determining the economic feasibility of a secondary recovery project is the recovery in terms of barrels per acre. This factor is computed from core analysis including actual flooding of cores, and it may also be estimated from the primary development and production record of the field or property.

Permeability: This factor determines the injection pressures and well spacing in secondary recovery operations. Also in tight, consolidated sands, the permeability is a guide to the selective shooting of explosives in water injection wells, thereby opening the tighter sections to water flooding.

Viscosity: In secondary recovery projects in the eastern and mid-continent fields, the reservoir viscosity of the residual oil is not usually determined by direct measurement. However, it is generally assumed that the viscosity of the gas free crude oil at reservoir temperature is equivalent to the viscosity of the residual oil in the reservoir.

California Conditions

The various factors affecting secondary recovery have not been determined in California fields to a sufficient extent to warrant any final conclusions as to the probable value of secondary recovery methods in the various fields of this State. This is particularly true of the older fields, many of which were drilled prior to the advent of the core barrel and certainly prior to the development of core analysis.

From a study and correlation of the fragmentary data available on the older fields and the considerable data available on fields developed during the past ten years, it has been possible to compile tentative values on California fields for the principal factors involved in secondary recovery as it has been applied in eastern and mid-continent areas.

The accuracy of these tabulated data on California fields compiled in this manner is not sufficient to predicate specific secondary recovery operations and results, with respect to individual fields. However, it is believed that the errors inherent in this approach to the problem have sufficient compensation to warrant the presentation of these data in graphic form, and that such a presentation will portray the right order of magnitude of these factors in comparison with the corresponding factors in the eastern and mid-continent fields where secondary recovery has been successfully applied.

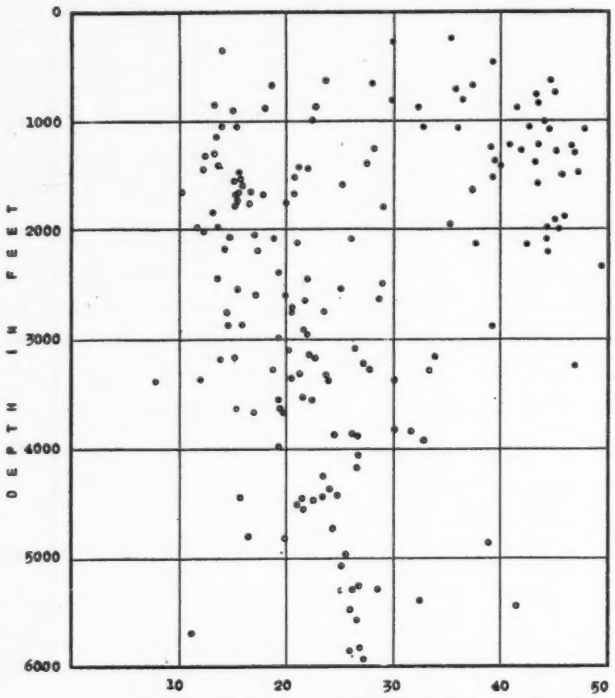

FIG. 1. DEPTH - GRAVITY DATA.

- CALIFORNIA OIL FIELDS
- EASTERN AND MID-CONTINENT OIL FIELDS UNDER SECONDARY RECOVERY.

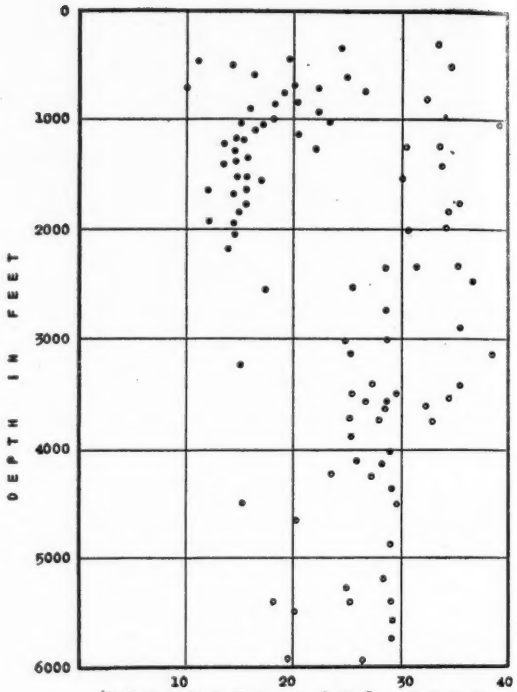

FIG. 2. DEPTH - POROSITY DATA.

- CALIFORNIA OIL FIELDS.
- EASTERN AND MID-CONTINENT OIL FIELDS UNDER SECONDARY RECOVERY.

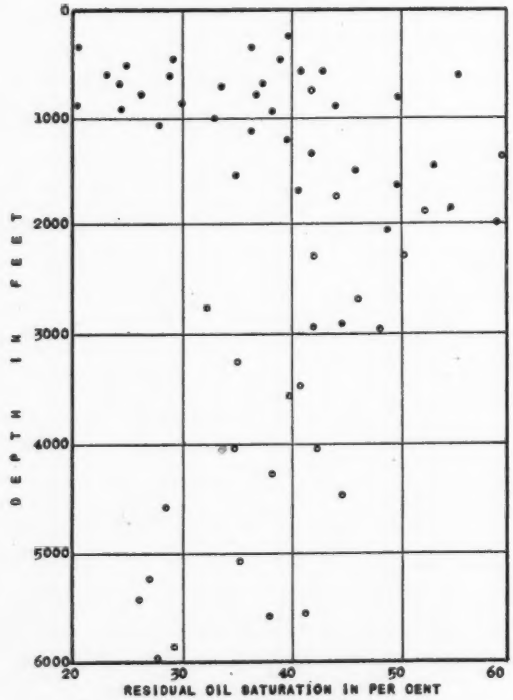

FIG. 3. DEPTH - SATURATION DATA.

- CALIFORNIA OIL FIELDS. BASED ON ESTIMATED INITIAL OIL IN PLACE LESS ULTIMATE PRIMARY RECOVERY.
- EASTERN AND MID-CONTINENT OIL FIELDS UNDER SECONDARY RECOVERY.

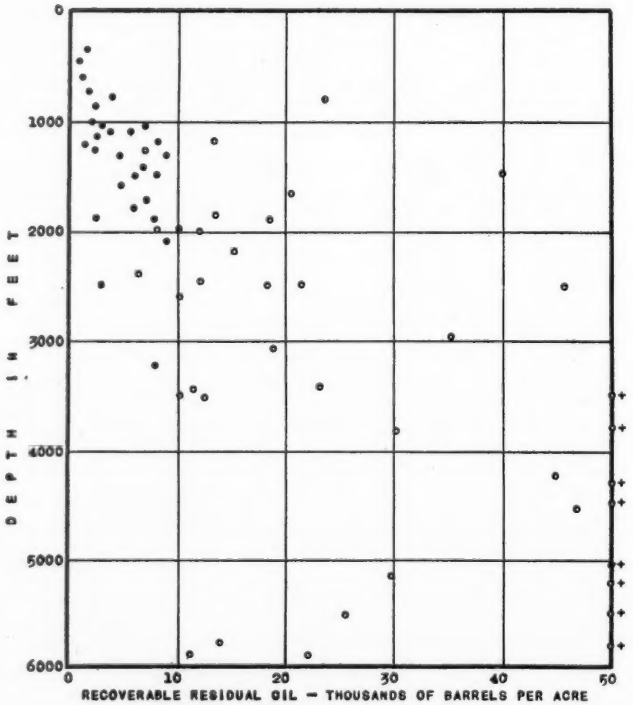

FIG. 4. DEPTH - RECOVERY DATA.

- CALIFORNIA OIL FIELDS. ESTIMATE BASED UPON 50 PER CENT OF ULTIMATE PRIMARY RECOVERY AND A 25 PER CENT MINIMUM RESIDUAL OIL SATURATION AFTER SECONDARY RECOVERY.
- EASTERN AND MID-CONTINENT OIL FIELDS UNDER SECONDARY RECOVERY.

Figure 1 is a "scatter diagram" of depth vs. gravity, for California oil fields compared with eastern and mid-continent areas. It will be noted that secondary recovery has been applied almost exclusively to shallow, high gravity fields, and that this type of field is rare in California.

Figure 2 compares the depth-porosity relationship in fields under secondary recovery, with California fields. California porosities, particularly in the shallow fields, are very much higher than the porosities in fields under secondary recovery.

Figure 3, Depth-Saturation Data. In presenting these saturation data, attention is particularly directed to the sources of these data for California fields as compared with fields under secondary recovery. In the latter fields, the residual oil saturation after primary recovery has been directly determined by core analysis. In California, however, very few such direct determinations have been made, and therefore the residual oil saturation data shown are based on the estimated initial tank oil in place, minus the estimated ultimate primary recovery. How accurately this method reflects the actual residual saturation in depleted California fields can only be determined by core analysis in such fields.

Figure 4, Depth-Recovery Data. Experienced secondary recovery operators in the eastern and mid-continent fields have found that a high primary recovery in barrels per acre usually indicates good secondary recovery possibilities. However, this is not invariably true, as the residual saturation after primary recovery may be too low to provide a satisfactory margin for secondary recovery.

The recovery data in Figure 4 show the recoverable residual oil in barrels per acre, to be obtained by secondary recovery. The data for eastern and mid-continent fields are from actual secondary recovery operations in those areas and show recoveries ranging from less than 1,000 barrels per acre to a maximum of about 10,000 barrels per acre. As a rule these secondary recoveries equal 50 to 100 per cent of the primary recoveries. For California fields secondary recoveries equal to 50 per cent of the primary recoveries have been tentatively used in Figure 4, provided, however, that these estimates of secondary recovery leave a remaining final residual oil saturation of not less than 25 per cent. Although the percentages vary, this method is used for preliminary estimates of secondary recovery in eastern and mid-continent fields and results in values within the 1,000 to 10,000 barrel per acre range of actual secondary recoveries in these areas. However, this method applied to California fields gives the values shown in Figure 4 of 10,000 to 50,000 barrels per acre, with eight fields below 3,000 feet in depth having values in excess of 50,000 barrels per acre. These figures appear reasonable only when the very great thickness of the producing sands in California is compared with the thickness of the producing sands in eastern and mid-continent fields under secondary recovery.

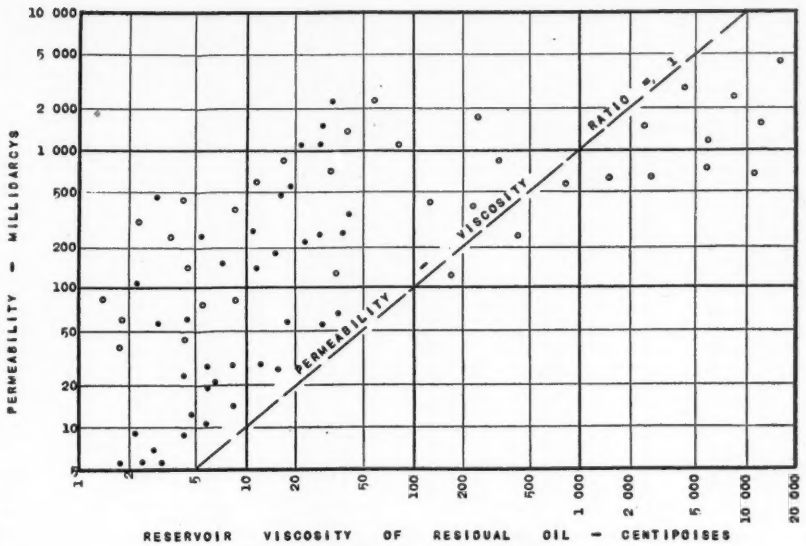

FIG. 5. PERMEABILITY - VISCOSITY DATA.
- CALIFORNIA OIL FIELDS.
- EASTERN AND MID-CONTINENT FIELDS UNDER SECONDARY RECOVERY.

Figure 5 shows permeability plotted against viscosity, both on logarithmic scales.

Production rate formulae for both primary and secondary recovery, and injection rate formulae for water flooding, show that the rates are a direct function of the permeability/viscosity ratio. It would therefore appear that the data shown in Figure 5 should be significant in comparing California fields with fields under secondary recovery.

It should be noted that no secondary recovery has been applied to residual oils having a reservoir viscosity above 50 centipoises. In California fields these viscosity values may run as high as 10,000 centipoises in some of the shallow low gravity fields. It is generally assumed that these excessive viscosities preclude the successful application of established secondary recovery methods in these fields. In Round Mountain and Mt. Poso fields, which have active water drives, the reservoir oil viscosity is several times 50 centipoises and high recoveries are being secured. However, in these fields one-half of the primary recovery is at water-oil ratios of 10 or over. This provides an indication of the relative water volumes required for water flooding fields having these characteristics. Also, these highly viscous oils occur in highly permeable sands, so that permeability/viscosity ratios in California compare somewhat more favorably with similar ratios in secondary recovery fields.

Conclusion

Actual operating experience with secondary recovery projects in California fields is absolutely essential, in order to determine its value and the extent to which it may be successfully applied in this State.

Primary production methods will ultimately recover about ten billion barrels of oil from California fields. Over six billion barrels of this oil has been produced to date, leaving less than four billion barrels of remaining primary reserves.

California oil fields cover an area of about 200,000 acres. Tentative tabulated data on these fields show approximately forty billion barrels of oil originally in place. The estimated ultimate primary recovery of ten billion barrels is equal to 25 per cent of this oil in place, leaving a total residual oil, after primary recovery, of thirty billion barrels. It is estimated that about one-half of

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this residual oil is in the low gravity fields where the viscosity may be too high for the successful application of established secondary recovery methods. Of the remaining fifteen billion barrels of residual oil, about five billion barrels is in the newer, deeper fields where more efficient primary recovery methods, including pressure maintenance, should secure all of the recoverable oil and thereby eliminate the possibility of establishing secondary reserves in these fields. This leaves an estimated ten billion barrels of residual oil in selected California fields, in which the established methods of secondary recovery might be applied. At the present time, no portion of these ten billion barrels of residual oil can be set up as secondary reserves; they must be proven by one or more actual secondary recovery projects in each of these selected fields before any of this residual oil can be classed as reserves.

The present situation with respect to possible secondary reserves from this residual oil in California might be compared with primary reserves to be developed from potential oil lands. In the latter case, primary reserves can only be established by actual exploration of these potential oil bearing areas and likewise secondary reserves can only be established by actually exploring the possibilities of secondary recovery methods in California.

That this situation is recognized by the California oil industry is well illustrated by the current aggressive work of the industry committee on Secondary Recovery for District 5 of the Petroleum Administration for War. This committee fully recognizes the immediate need for exploring secondary reserves in California as a war measure, and several experimental secondary recovery projects are now under way or are scheduled for the near future.

It appears certain that within the next year many of the questions regarding secondary recovery in California will be answered by specific data obtained in the development and operation of a number of secondary recovery projects in this State.

1—"Secondary Recovery of Oil in the United States," A.P.I., 1942.

2—Symposium on Secondary Recovery presented at the 28th Annual Meeting of the A.A.P.G., Ft. Worth, Texas, April 9, 1943.

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Fig. 1640
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Fig. 1430
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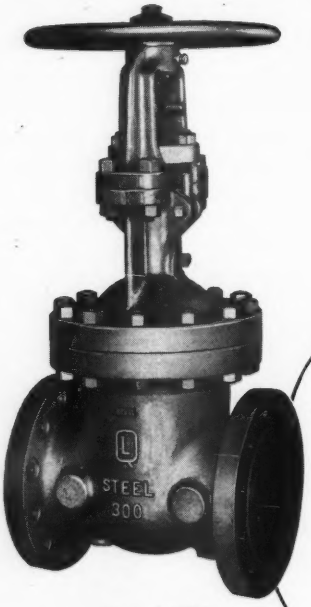

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By Gustav Egloff
President, American Institute of Chemists; Research Director, Universal Oil Products Co.

It won't be long after this war is over when we shall be riding in automobiles powered by engines one-fourth the present size, some of which will have 16 cylinders—you will be able to pack one of those motors in an ordinary suitcase. You will get at least 50 miles to the gallon of present-day or fighting and bombing aviation gasoline, with a smoothness of driving never dreamed of before. Your car will be equipped with tires made of the new artificial rubber which will give at least 100,000 miles' wear. It may easily be that you will have to buy a new car to fit your old tires, instead of new tires to equip your old car. Blowouts will be practically unheard of.

Majestic palaces of the sky—as luxurious as the Normandie and Queen Mary, and carrying 1,000 or more passengers—will before many years be hurtling through space at 500 or more miles an hour, making all parts of the world in less than 24 hours from any center of air travel. The atmosphere for ten miles up will be crisscrossed with an intricate pattern of flying routes, with different levels, like radio bands, for local and express and freight and passenger traffic.

These are but two of the miracles in store for the new after-the-war world. They will be possible because of the refinements and new developments in the mysterious and fascinating black gold drawn from the bowels of the earth—crude oil. Already there are more than 2,000 distinct products being made out of that greasy, smelly substance, ranging from fuel for battleships to delicate perfumes for milady's evening charm, and from Christmas candles to fertilizers. Floor wax, hand lotions, laxatives, explosives, candy, and chewing gum are some of the other things extracted from it which indicate its almost infinite possibilities.

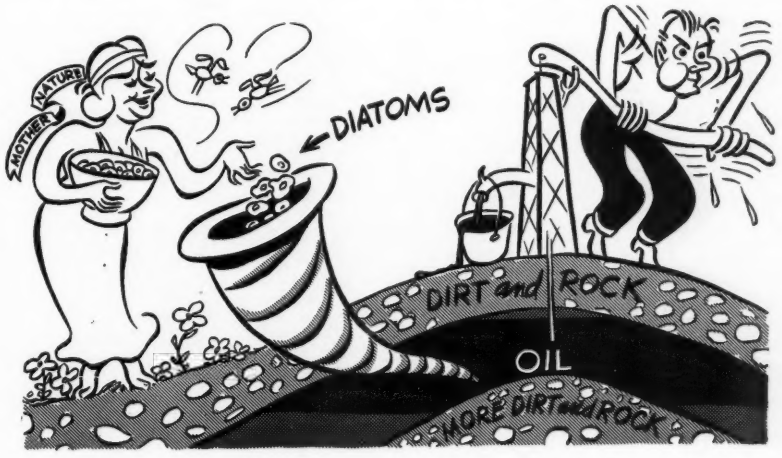
Oil being so vital not only to the war, but to the better life we hope to have when it is won, it is natural to ask: Will our supply of petroleum stand the drain? I think so.

The United States, alone, has more than 375,000 oil wells with capacity of more than 4 million barrels of petroleum a day. It controls two-thirds of the world's oil. There are doubtless millions of acres of oil-producing territory in the Western Hemisphere not yet discovered or developed, upon which America's 14-billion-dollar industry—spending 100 millions a year in research—can draw. Many other parts of the earth should prove to be not less rich. And— ,

Oil is probably being produced by Nature faster than it is being consumed by man.

Investigations have brought to light facts regarding earth processes which convince us that oil is constantly being formed. This theory of continual petroleum formation is supported by the fact that oceans, lakes, and rivers today abound with fish and mollusks resembling those found in petroleum-bearing formations. We find myriads of microscopic creatures, such as foraminifera, radiolaria, and diatoms,‡ which are identical in body structure with Santa Maria fields of California and other oil-producing structures. Such diatoms, scooped alive from the ocean today, yield about 2 per cent of oil by ether extraction, although they contain about 16 per cent organic material.

Yielding 2 per cent of oil, the diatoms in the Monterey shale (which constitutes a bed 800 square miles in extent and half a mile thick in one section of California) would produce 2 billion barrels of oil. Present-day sedimentation of organic matter is occurring in closed basins of the North American Continental Shelf, particularly along the western coast of California. In other oceans and in the deeper waters along the West Coast, diatoms are depositing, with organic content



constantly increasing.

From the foregoing we may conclude that Nature is producing oil at a faster rate than gas pressure or pump strokes can bring it to the earth's surface. What man has secured is not comparable in volume with what has been produced and still is being produced by natural forces. Nature is prodigal. So we may take heart for the future—but now let's review the major uses to which we are putting petroleum.

---

†Diatoms are brown, one-celled plants. They grow in jellylike masses in both fresh and salt water and are food for small animals which, in turn, are food for fish. The shells of diatoms are composed of silica (sandy substance) which will not dissolve in water, hence deposit at the bottom of bodies of water. Most geologists and chemists believe petroleum is formed from decomposed organic matter such as diatoms (perhaps under pressure and heat, possibly with the silica of the shells acting as a catalytic agent), which is then absorbed by porous, sedimentary (water formed—i.e., not volcanic) rock. Because oil floats on water, great water pressure within the earth can force the oil into an inverted geologic saucer (called a dome) where it is trapped until tapped by oil drills and brought to the surface. Modern (geophysical) oil prospecting is done by an electronic device which records differences in vibrations, set off by small explosions, as they move through earth, rock, and underground "pools" of oil.—Author.

Bends

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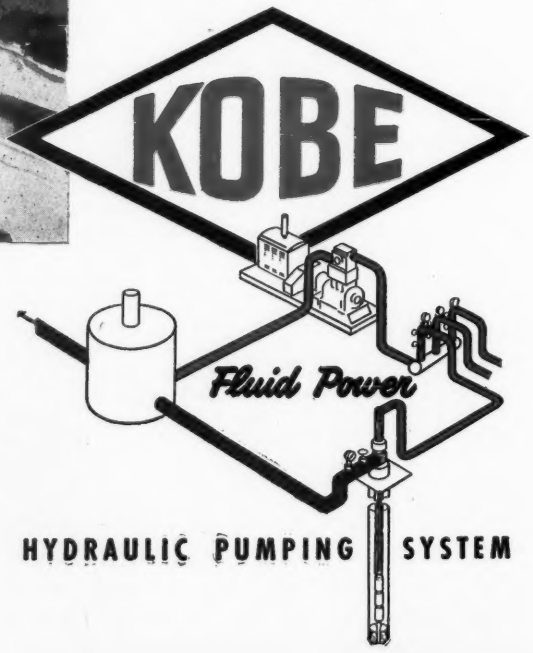

Motor Fuel

Literally, oil is the new fuel for the new age. I say "new age" because as a noted scientist has said, "1940 is already antiquity." Aviation motors in use today are as radically improved over the 1940 models as the 1940 products were over 1915 types. Fuel for those motors not only has kept pace with them, but has gone ahead. The 100-plus octane gasoline, which 12 years ago cost $10 a gallon to manufacture in laboratories and now only 15 or 20 cents in refineries, will power your car of the future. It will give you 100 per cent more mileage per gallon, longer wear, quicker pickup, more carrying power, smoother riding, and a power you've never before known at the wheel. A foretaste of it is indicated in the comparative aviation records of 100-octane gas compared to 87-octane used in a bombing plane. With 87-octane gas it took 19 minutes for the plane to reach an altitude of 26,000 feet; with 100-octane gas it was done in 12 minutes! With the inferior fuel the plane reached a 33,000-foot ceiling, but with the newer gas it touched 37,000 feet!

But in the laboratories has been developed a fuel much superior even to the best now used in fighters and bombers. So when you think of your automobile of a few years hence, picture it with a supercharged motor operating on 120-octane or better gasoline—and with a body of light metals, plastic, or plywood with transparent corner posts to give you unobstructed vision of the highway.

Probably your son's family or business car won't be a car at all, but an airplane. The war is producing a generation as much at home among the birds as you are among your sluggish fellow mortals who move about on the earth.

Lubricants

No wheel would turn, no machine would operate, time itself would stop (I'm thinking of watches and clocks!), if our lubricants were suddenly to be exhausted. And the primary source of lubricants is petroleum. In normal times in the United States, for every 25 gallons of gasoline consumed a gallon of lubricating oil is needed.

Today we virtually hand-tailor lubricants for specific uses. Those used in wartime aviation must do their job when the plane is in the frigid stratophere as well as when, a few minutes later, it may be zooming over a torrid desert—a possible 200-degree variation! Many new processes had to be developed and products synthesized to take the punishment of tanks, ships, and the newer tools of industry operating at high speeds and enormous temperatures.

In this, chemicals added to lubricating oils have proved useful. Many of these compounds contain phospohrus, chlorinefi sulphur, oxygen, etc. So-called detergents in high-speed Diesel engines keep the sludge from building on the rings by their washing effect.

One of the most difficult problems the oil chemist has to face is to produce superfine lubricants required for modern guns, exceedingly delicate watches, chronometers, and other instruments required in the modern fighter, bomber, and transport planes. In peacetime some superfine watch lubricants were marketed for as much as $300 a gallon!

Rubber

I have mentioned tires good for 100,000 miles of trouble-free service. They are a reasonable expectation because we can with petroleum make a rubber much better than that obtained from trees and plants.

Neoprene rubber is based upon acetylene, which for years has been produced almost entirely from coal and limestone in electric furnaces, but is now being synthesized in part from petroleum and natural gas. Thiokol rubber is manufactured from ethylene derived from the cracking of oil, chlorine, and sulphur; Buna S rubber is produced from styrene from coal and petroleum, and butadiene is derived from grain alcohol and petroleum.

Rubber demands are increasing as the tremendous flow of airplanes, tanks, motor trucks, ships, trains, and gun mountings pour out of the factories. Medium-sized tanks require 500 pounds of rubber, and the gasoline tank of a Flying Fortress uses the same amount. Gas masks require three-quarters of a pound each, while battleships use up to 75 tons of rubber each. Excavation trucks used by the Army with tire diameters of nearly ten feet require 3,500 pounds. Blimps and barrage balloons, rubber boats, rafts, safety vests and suits for fliers, and hospital supplies—all these presage a terrific wartime demand for petroleum-based rubber. We'll need 850,000 tons next year—and when peace comes once again to our world, we can be assured that the need will not be less.

Note in passing: Ironically, press dispatches from the Far East indicate that the Japanese are cracking rubber to produce gasoline and other oils, while we crack petroleum to produce rubber. This may be an indication that the Japanese are running short on oil despite the fact that they have taken over the Far Eastern oil fields of the Dutch and British.)

Food Supply

When oil is cracked to produce motor fuel, olefinic gases are by-products. These gases, such as ethylene, propylene, and butylene, hasten fruit ripening and growth. Ethylene was first used to ripen oranges rapidly, by putting a tent over each tree or storing the unripe fruit in a room and adding a small percentage of ethylene. By the use of this meth-

od of ripening, the fruit could be shipped without loss due to rotting.

The growth of potatoes has been doubled when the seedlings have been treated with ethylene. And the potatoes grown proved to be more numerous and larger and contained a higher percentage of vitamin C.

The Russians have shown that butylene gas has a stimulating effect on the growth of such trees as apple, apricot, pear, cherry, plum, peach, and walnut. The method of treating a tree is to enclose it in a tent for two weeks before the normal leafing time. Butylene is passed into the tent in small quantities.

Acetylene, now coming from petroleum, is being used in Australia to increase the growth of pineapple plants. In California, fruit orchards are fertilized by ammonia added to the irrigation water, this ammonia being produced from the nitrogen in the air and the hydrogen from the cracking of petroleum.

Health Protection

Everyone knows how a film of oil in swamps, stagnant pools, and other dark, damp places will destroy mosquito-breeding beds. But that's only a beginning in the usage of oil to combat man's tiny foes.

I can't reveal details, but I can say that oil is now being used to fight or control many diseases and mosquitoes, rats, leeches, fleas, flukes, bats, and a host of other unseen or small enemies of our fighting men. When the war ends, we shall have an amazing arsenal of oil and chemical dust and insect sprays which may do much to make the Tropics habitable.

Et Cetera

To list all the benefits petroleum has brought to man would fill this magazine. For example, there's a new grease which enables a submarine to submerge without leaving a telltale smear of oil on the water. It lubricates exposed parts, but when bits are released, they do not float; they sink below the surface.

Then there are oils for the flotation of metals out of their native ores, and for cutting steels, and for insulating transformers and cables that snake under streets; asphalt for roads and roofs, and wax for paper; cosmetics and chewing gum; tree sprays and cleaning fluids; refrigerants and antifreeze compounds; paints and varnishes; impregnators for matches; rustproofing and preservatives for wood and eggs; cow sprays and battery-sealing compounds; and innumerable plastic objects for house and car.

This hop-skip-and-jump survey of petroleum's usefulness to man may raise in your mind questions about the history of this versatile commodity. I know veterans of the American Civil War who are still living and who remember when there was no such thing as an "oil industry." Yet oil has been known

to and used by man since earliest antiquity.

Archaeologists have dug up petroleum-bearing vessels dating back to the time of Abraham on the ancient site of Ur in Chaldea. Egyptians more than 7,000 years ago used oil in their amazing—and never equalled—embalming process. (The modern counterpart of that is the preservation of eggs by coating them with paraffin oil.) Babylon was surrounded by a wall, the bricks of which were cemented with an oil composition. The Phoenicians about 5,000 years ago used boats sealed against leaks with an oil product.

The Chinese are known to have drilled wells for oil for fuel as early as two centuries before Christ. Pliny, the historian, tells how in the 1st Century near the city of Samosatis there was a pond "yielding a kind of slimy mud, which burns even though water is cast upon it. Only dirt will quench it." He also records that petroleum was used for light and that "oil obtained from Sicily was burned in the lamps of the temple of Jupiter." During the Crusades in the Middle Ages naphtha from petroleum was employed in crude "flam throwers" in the defense of Constantinople. Marco Polo in the 13th Century wrote of a pool of oil in Armenia which was "good for burning and for the cure of distempers in men and cattle." Three centuries ago there was an extensive oil industry in Baku on the Caspian Sea.

The first oil discovery by a white man in America was made at a spot near the present Cuba Lake, New York, in 1627 by a missionary priest. Other "oil springs" were reported later, and it was revealed that Indians used the substance for toothaches and headaches. In 1753 George Washington learned of the existence of petroleum in western Pennsylvania while on a visit there; he got hold of some of the oil lands and held them as an investment. He listed them in his will—including a "burning spring." During the Revolutionary War American troops bathed in oil from Oil Creek and, according to General Benjamin Lincoln, "were relieved from rheumatic pains, and those who sampled the oil internally found it a gentle purge." Indians to the west sold "fossil oil," good as a medicine and as an illuminant, to white men at $20 a quart, bartering "fire water" as an equivalent.

In 1828 Pittsburgh gave thought to lighting its streets with oil lamps. In 1829 a Kentuckian, boring for salt water, evidently struck a "gusher" because a newspaper reported that "the discharges were by floods, at intervals of from two to five minutes, each flow vomiting forth many barrels of pure oil and the flow continuing for three or four weeks, finally subsiding into a constant stream." Oil drained into the Cumberland River and was set on fire, the river "burning" for more than 40 miles.

Thus centuries of "toying" with a vast possibility went on until 1859, when "Drake's Folly" launched one of the greatest and most romantic industries of all time. Salt-well drillers of Pennsylvania had long been troubled by a thick, greasy substance infiltrating their wells and destroying them. A shrewd merchant came along, bottled the stuff, and sold it as a medicine, "Kier's Rock Oil." A New York lawyer saw a chance for profits and hired an ex-conductor to bore for oil. The wildcatting was labelled "Drake's Folly," named after the man who drilled the 69-foot well and brought it in on August 27, 1859. But from it sprang a boom that for fantastic results far surpasses any gold rush or diamond find known to history. As one historian records, "Almost overnight the new-born industry became a bawdy, brawling, prodigal youth. Quiet Pennsylvania villages awoke

(Continued on Page 27)

A "Must" for December 15th

The annual Christmas Dinner and High Jinks of the Wildcat Committee of the California Oil and Gas Association will be held December 15 in the Los Angeles Biltmore Bowl.

Proceeds from the affair will be used to aid disabled service men. The beneficiary will be the Arts and Skills Program administered by the Los Angeles Chapter of the American Red Cross.

Arrangements are being made to have a speaker of national prominence address the large group of oil men which is expected to attend, and a group of Hollywood entertainers will also contribute to the excellent program.

In explaining the Arts and Skills Program, L. L. Aubert, Wildcat Committee chairman, said:

"The Red Cross tells us that the task of mentally rehabilitating disabled service men is much greater than physical rehabilitation. Although the government hospitals provide remedial exercise in the form of occupational therapy, the benefits are purely physical and not mentally recreational.

"Arts and Skills are generally patterned on work which can be done by hand. It has been shown that as the men become more interested and seek to create new things, their mental condition improves tremendously with a corresponding improvement in physical condition."

Proceeds from the Christmas Jinks will be used by the Red Cross to finance the Los Angeles Arts and Skills Program which will take in the permanent government hospitals at Sawtelle, Long Beach, and a new hospital now being built in the San Fernando Valley. The cost of supplying the raw materials and equipment for this project will not exceed $10,000 a year.

"The Wildcats feel sure," Mr. Aubert said, "that men in the oil and allied industries will welcome the opportunity to give needed help to our disabled men of this war and that the Bowl will be a sell-out as was last year's benefit program."

Valve Situation Eases

There is evidence that manufacturers of products for essential wartime industries are getting "over the hump" and that orders for less critical needs now have a good chance for delivery within a reasonable time.

According to an announcement just released by Merco Nordstrom Valve Company, available manufacturing facilities not suitable for the production of critical steel valves are being devoted to semi-steel valves. This will permit immediate stock deliveries of certain sizes and figure numbers, thus relieving an aggravating condition in many industries.

In the near future, the manufacturer states, orders will be largely completed for top priority Nordstrom Cast Steel Valves desperately needed in synthetic rubber plants and high octane refineries which in turn gives excellent prospect of delivery within ninety days of steel valves for other uses.

Critical war orders necessitated a 600 per cent increase of valve tonnage over normal plant capacity for a short period, according to Colonel Willard F. Rockwell, who is President of the Company. This enormous load has been reduced by special efforts and the time when deliveries can be resumed for other needs on a greatly expanded basis is now in sight.

The entire valve industry is emerging from a very trying period, much to the relief of many valve users. Instead of waiting until the post-war period, valve purchasers may be able to obtain essential valves now. Easing of the valve situation may be forerunner of solutions for many other manufacturing problems. Certainly this is glad news for the petroleum industry in particular.

G-E Makes "Bazooka" For Army

America's new anti-tank weapon, the "bazooka," described as something that might have come out of a highly imaginative comic strip, has been in mass production at one of the General Electric plants for about a year, Company officials have just announced.

Space and facilities in an unrevealed plant of the G-E appliance and merchandise department were converted from the making of home electrical appliances to manufacture of the revolutionary "bazooka". Girls who formerly made washing machines and similar devices make the weapon.

Soldiers dubbed it the "bazooka" because they saw in it some remote resemblance to the wierd musical instrument made famous by Bob Burns, the Arkansas comedian.

Major General L. H. Campbell, Jr., Chief of Army Ordnance, has revealed that the weapon is being supplied in quantity to both American and Allied forces.

"During recent operations in Africa", General Campbell explained, "a small but strong fort gave considerable trouble to the Americans. One lone American soldier detached himself from the landing party, waded ashore and with one shot from his gun effected surrender of the fort. That will be known as the saga of one American soldier and his bazooka.

"This weapon has been successfully used by our forces in Africa to destroy fortifications and tanks. It is so simple and yet so powerful that any foot soldier using it can stand his ground with the certain knowledge that he is the master of any tank which may attack him."

Though the "Bazooka" is small enough to be fired by one man, usually after a second man loads it, such a powerful projectile is hurled that, after one shot struck a nearby tree, the commander of six enemy tanks surrendered them in the belief that he was being shelled by 155-mm guns.

Willing to lease the Welcome Oil Company's 321 acres in Section 2, 26-18 Kern County, California.

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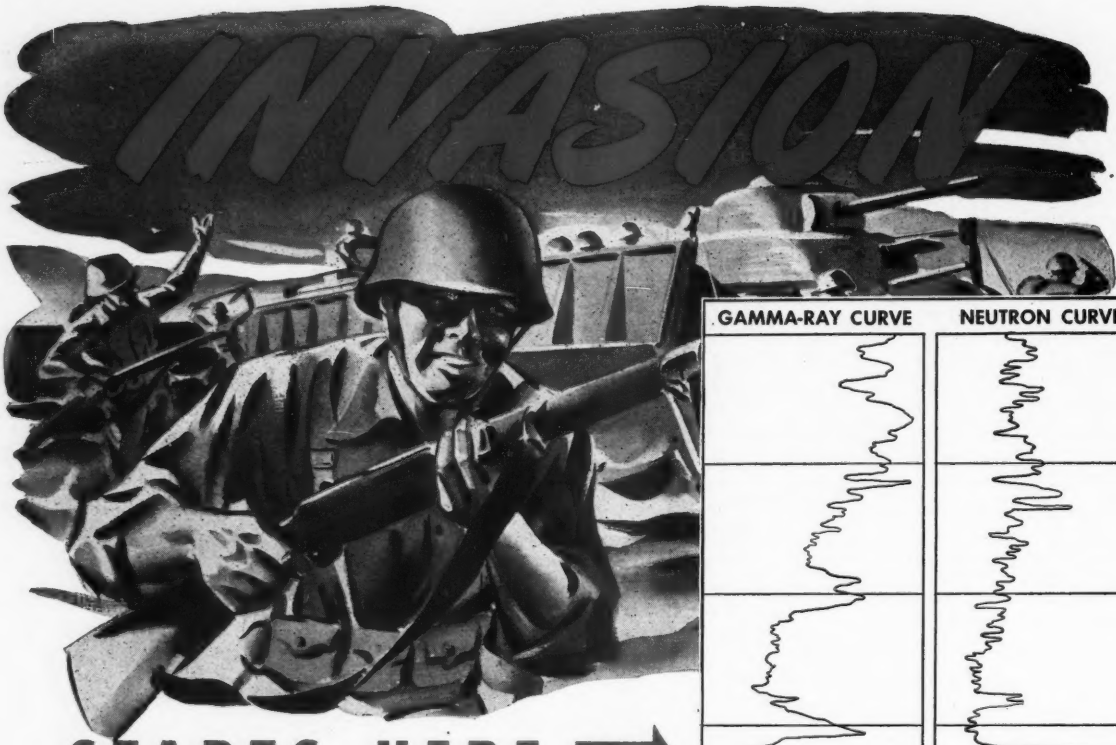

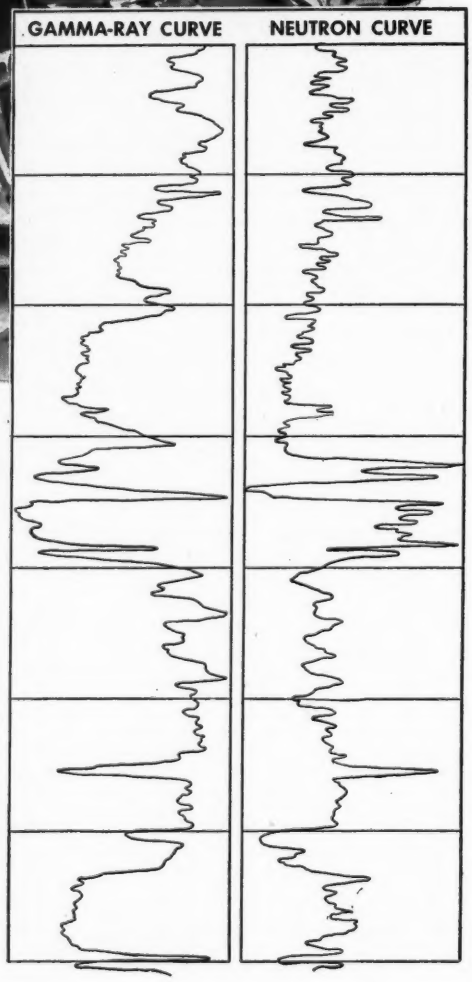

STARTS HERE

Millions of barrels of oil—additional production that was cased off during original completion programs—are flowing into tankers and airplanes to provide fuel for INVASION. The steel, ordinarily required, is being used for tanks, guns and ships.

Lane-Wells provides American oil well operators with the services and tools that enable them to produce *more* oil *more* efficiently, with *less* steel. The methods made possible by these Lane-Wells services will help to assure an adequate supply of petroleum products for the Allied Forces throughout the world.

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Nomads October Meeting

A discussion of the prospects of the Russian conference and motion pictures of military action in all theaters of war were the highlights of the regular monthly dinner meeting of the Los Angeles Chapter of Nomads held in Los Angeles, Wednesday evening, October 13, 1943. After opening the meeting, Henry Pullman, president of the Los Angeles Chapter, led in the Pledge of Allegiance to the Flag and then turned the meeting over to the master of ceremonies for the evening, Ralph Clemmons. Hi Cassidy served as master of ritual for the induction of two new regular members and one associate member, B. M. Landis, H. H. Peters and H. F. Schlittle, respectively, and, with the assistance of a number of members present, conducted one of the wittiest initiation ceremonies ever put on by the chapter. W. J. Williams, who had been elected a regular member, was not in town and could not be inducted.

The speaker of the evening was Dr. Thomas Harris, National Secretary of the Council of Soviet Friendship who spoke on "What Does Russia Want?" This discussion was "down-to-earth" and left out all sentimental and sloganistic material that usually accompanies talks on war aims. This was followed by a moving picture entitled "The Bombing of Tokio," which actually showed scenes of fighting on land and sea in the Pacific, in Africa and in Sicily.

There were 75 members and guests present at the meeting and among those from foreign countries were M. H. Hobbs for the N.K.P.M., formerly in the East Indies; Johnny Aston of Ultramar from Argentina; Ray J. Towsey of Cia Consolidada de Petroleo from Venezuela; A. F. Driskill of Iraq Petroleum Co. from Iraq; and H. F. Brewen of I.P.C. from Peru. C. E. Whitney of the Houston Chapter was also a visitor.

P.A.W. Foreign Division Reorganized

Reorganization of the Foreign Division of the Petroleum Administration for War into three divisions with an over-all operating committee to coordinate their functions was announced on Oct. 28 by the Petroleum Administration for War.

The following were named to head the new divisions:

William D. Crampton, director of the Foreign Supply and Distribution Division. He was associate director of the former Foreign Division.

William B. Heroy, director of the Foreign Production Division. He was transferred to the new division from his post as PAW's Director of Reserves. No one has been named to succeed him in the latter position.

C. Stribling Snodgrass, director of the Foreign Refining Division. He was associate director of the former Foreign Division.

Acting Petroleum Administrator Ralph K. Davies said that the three new divisions will continue to function along the same lines that they pursued when they were organized as sections in the Foreign Division. In recent months the work of each section had developed to the point where it was becoming unwieldy to operate as one Division, Mr. Davies explained.

Coordination of the activities of the three foreign divisions will be the responsibility of the Foreign Operating Committee, which will consist of Mr. Crampton as chairman, and Mr. Heroy and Mr. Snodgrass as members.

Pearson Named Sales Manager, Superior Engine Division of National Supply

The National Supply Company has announced the appointment of R. M. Pearson as Manager of Sales, Superior Engine Division.

Mr. Pearson has been affiliated with The National Supply Company since 1936 in the capacity of Sales Representative serving the marine trade and the inland waterways. He has been actively engaged in the sale of Diesel Engines for the past twenty years and served on the Sales staffs of Fairbanks, Morse & Company; General Motors Corporation, and American Locomotive Company prior to his service with Superior.

Before entering the Diesel field, Mr. Pearson was prominent in engineering circles in the Pittsburgh area in a designing and executive capacity.

Petroleum Goes to College

(Continued from Page 24)

to find their population multiplied a hundredfold, swarming with gamblers and swindlers as well as honest, but venturesome, men impatiently seeking a quick fortune in rivers of oil."

Just one year year later—1860—an oil shortage was predicted! "Authorities" held that the crude-oil production of 500,000 barrels a year would soon exhaust the natural supply. This dire prediction of "The end is in sight!" has been repeated about every five years—yet now nearly a billion and a half barrels are extracted from the ground annually in the United States, whose known reserves are more than 20 billion barrels. Right now there is a "shortage" because of inadequate transportation facilities, but I venture the prediction that as we return to peacetime conditions, unknown resources will carry America for many years to come. With Nature constantly creating new reservoirs, the world outlook for petroleum is good.

I have ridden in oxcarts at 15 miles a day and in automobiles that do 500 easily. Now planes fly 5,000 miles in 24 hours. In such facts I see an omen of the future. What man has achieved is but a hint and a guide post of what is to come as we further explore the possibilities in hydracarbons and learn of their usefulness for the human race.

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Reprinted through courtesy The Rotarian Magazine.
Cartoons by Ray Inman.

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Women Aid Manpower Shortage

About 10,000 women are employed in all types of work in petroleum refineries in the United States, and many more will be hired before the war is over, Deputy Petroleum Administrator for War Ralph K. Davies said recently.

Urging U. S. refineries to keep up their production of petroleum products by hiring women to supplant the men who are called to the armed forces, Mr. Davies said:

"Experience has shown that women can do and are doing excellent work in refineries throughout the country. Despite the fact that the petroleum industry is losing many skilled workers to the draft and to other types of employment, it is essential that there shall be no reduction in the processing of petroleum products because of lack of manpower.

"A number of refineries already are employing women in all parts of their plants, and the results have been gratifying. As the war continues, more and more plants will find it necessary to train women to tasks that have heretofore been considered possibly only for men to do.

"Recent studies indicate that, by approaching the problem carefully, the number of jobs which cannot be assigned to women is much less than would appear at first glance."

The Deputy Administrator referred to a study conducted at the request of PAW by the Bureau of Labor Statistics of the Department of Labor.

In 74 refineries in which the study was conducted 27,646 persons were employed, of whom 2,627 were women. Of this group 856 women worked on refinery operations, 39 on maintenance, 477 in laboratories, 1,156 in offices, and 99 on other types of work. On the basis of this sampling, it is estimated that about 10,000 women are employed in all U. S. refineries.

Employment of women in refining operations has been made possible in part by job dilution and reorganization of job functions, in many cases women have replaced men on an equal basis, but in others the ratio of women in similar jobs ranges from three-to-two to two-to-one.

In most instances, women are paid the same rate as men for comparable work.

Some company officials consider women particularly suitable for refinery operations that characteristically require sense of timing and an ability to keep track of several continuous duties.

Because women cannot perform heavy-duty work, some refineries have devised mechanical aids, such as counterbalances, rollers, and conveyor belts. Result, in some cases, has been a reduction of labor costs. One company reported that when a short stretch of conveyor track was installed, it became possible to use 18 women to do the work formerly performed by 24 men.

One refinery already has organized its training courses into three periods: induction, training, and provisional (in which women actually perform the work to which they will be permanently assigned). Among other duties, women are taught to open and close valves, fire stills and boilers, start and stop pumps, gauge tanks, handle laboratory equipment, and to perform other refinery operations.

More than 100 automatic control charts are employed in production of aviation gasoline at the Macmillan Petroleum Corporation refinery, Long Beach, Calif. Louise Byer, lab. technician serving during the manpower stringency, observes graph which records vapor pressure.

THIS LAUGH

OFF!!

Jane: They say a kiss shortens one's life three minutes.

Jim: How about killing off a few days, babe?

Two men met. "A little bundle from heaven came to our house yesterday." To which his friend replied: "So, boy or girl?"

"Neither, my laundry came back!"

Some men reform; others just grow too old to act up.

A rude and vulgar man is one who stares at a girl's figure when she's doing her best to display it.

"A lot for two points," commented the ration-conscious man as he gazed at the sweater girl.

Adolph and Franklin exceeded their rates,
And landed at the Pearly Gates.
St. Peter viewed the hectic pair,
And said, "You paid no heavenly fare."
The angry Hitler then replied,
"I'll blow the gates and blitz the hill."
"Proceed," said Franklin, with a will,
"I'll make a speech and pay the bill."

Cutie: All my life I've been saving my kisses for a great big strong man like you."

Sailor: "Baby, prepare to lose the savings of a life time."

Young Mosquito: "Soft pickings these days, aren't they?"

Old Mosquito: "Yes and to think, when I was your age I could bite girls only on the face and hands."

We hope you haven't forgotten the little farm girl who always went out with the city fellers because the farm hands were too rough.

Walking along the edge of an airdrome one morning, a man saw an old lady watching the proceedings.

"Hey, Grannie! Are you enjoying yourself?" he said.

"No I'm not," she replied.

"Why? Don't you like airplanes?"

"No, I don't. Ever since I was a little girl, and a bumble bee got up in my petticoates, I 'ates things that buzzes."

A true music lover is a man who, upon hearing a soprano in the bathroom, puts his ear to the keyhole.

Patient: "Is my mouth open far enough?"

Dentist: "Yeah! I intend to stand outside while I work."

He: Are you free for this week end, darling?

She: Well, not exactly free, but very inexpensive.

I never was dated, I never was wed,
I hardly would speak to a fem.
But I followed the hosiery-lingerie ads
And learned about women from them.

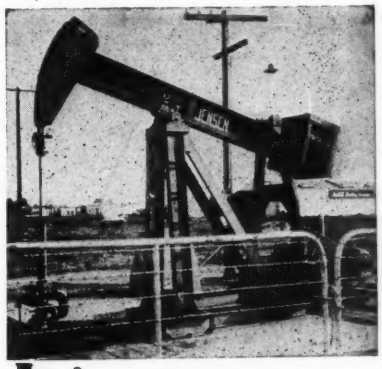
"Politics is the art of obtaining money from the rich and votes from the poor on the pretext of protecting each from the other."

Bride: I want the stark truth, my dearest.

Groom: Ah gee, hon? Didn't your mamma ever tell you? There ain't no stark.

"In times of trial" said the preacher "what brings us the greatest comfort?"

"An acquittal," responded a bright man in the back row.



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Field Development

Los Angeles Basin

Huntington Beach Tideland Active

The Tideland section of the old Huntington Beach field remains at a high point of activity. In the offshore pool the Huntington State Co. is placing No. 3 on production from the upper 100 ft. of the Jones sand while operators State No. 4 is coring oil sand and shale below 3200 ft. The latter well is located on the Pacific Electric right-of-way West of 20th St. To the East and West of this well foundation mats have been poured for eight additional wells.

Southwest Expl. Co. State No. J-7 has been placed back on production after repairing 8⅝ inch casing which was drilled into by State No. J-8. An unusual situation was caused by the contact of these two wells. State No. J-7 had been completed October 8th and was flowing under wraps approximately 200 B/D with 680 lb. casing pressure where State No. J-8 had drilled to 2143 and was pulling a whipstock when the casing in J-7 was damaged. J-8 blew out and was finally killed by pumping mud into State No. J-7. State No. J-8 is now drilling ahead below 3000 ft. after cementing 8⅝ inch casing over the Jones sand at 2650 ft.

Standard Oil Co. P. E. No. 27 was completed on pump November 2nd for an initial production of 60 B/D cutting 7.0% mud. Production is coming from the Jones sand between the depths of 2408 ft. and 3025 ft. Location has been staked for P. E. No. 28 approximately 1300 ft. east of this well. Wilshire Oil Co. is milling a window in 8⅝ inch casing preparatory to redrilling the Jones sand in No. 9A at 18th & Walnut. This well blew out and flowed 1000 bbls. in 12 hrs. while salvaging 6⅝ inch casing which was cemented over the Main zone.

C. C. M. O. to Drill at Whittier

C. C. M. O. Co. has poured foundations for East Whittier Comm. No. 1-1, located 550 ft. northerly and 132 ft. easterly at right angles from the center line of Wilshire Blvd. and Ocean View Ave. on Section 34-2s-11w. Unofficial reports say it will be a deep test well.

Newport Test Goes on Pump

Banning No. 2, the third attempt of the Signal Oil and Gas Co. at Newport Beach is pumping to the sump at an estimated rate of 12 barrels per day of oil with a cut of about 50%. Located on Section 20-6s-10w, the hole cored to a total depth at 3779 ft. in gray sand. Hole was plugged to 1720 ft. and 8⅝ inch casing cemented at 1622 ft.

Standard Plugs Deep Test Well

Standard Oil Co. Murphy-Coyote No. 129, deep test well of the West Coyote field, has been plugged to 6126 ft. and the Emery zone gun perforated in stages between 5349 ft. and 5763 ft. and is cleaning out preparatory to placing well on production. Located in Section 18-3s-10w, the hole was drilled to a total depth of 9295 ft. and has been standing suspended since July of 1942.

Bankline Completes Del Valle Extension

Bankline Oil Co. Sterry No. 101, northerly extension well at the west end of the Del Valle Field, was completed on pump for an initial production of 53 barrels 24.6 gravity cutting 1.4%. Total depth is 5029 ft. with gun perforations open from 4460 ft. to 4498 ft. Located in section 18-4n-17w the hole is approximately 1000 ft. north of the nearest producing well. West of this well operator is grading roads for Orduno No. 103 which is located 330 ft. north and 330 ft. west from the center of the section.

LOS ANGELES BASIN WILDCATS

Area	Well	No.	Section	Depth	Status
Aliso Canyon	Barnsdall-Bandini Pet. Co., Roosa	1	29, 3-16		Foundation
	Standard Oil Co., Frew	1-2	29, 3-16	2049	Drilling
	Standard Oil Co., Del-Aliso	1	29, 3-16		Grade
Calabasas	Br.-Am. Oil Prod. Co., Coleman	1	25, 1-18	602	Drilling
Del Valle	Standard Oil Co., N.L. & F.	3-1	19, 4-17	6200	Fishing D.P.
Norwalk	Gen. Pet. Corp., H. B. Allen	1	12, 3-21	8690	Drilling
Pomona	Macmillan Pet.Corp.,Walnut-Creek	1	22, 1-9		Rigging up
Puente	Horace Steele, Opr., Kenwood	1	17, 2-10	4275	Testing
	J. C. Drilling Co., Kelso	1	12, 2-10	3442	Idle
	Melvin Hansen, Well	2	24, 2-10	780	Drilling
Rice Canyon	General Pet. Corp., Mendota	1	22, 3-16	6834	Fishing D.P.
Sylmar	Richfield Oil Corp., T.I.T.	1	19, 3-15		Rigging up
Temescal	The Texas Co., Dominguez	57-1	1, 4-18	7308	Abandoned
Whittier	C.C.M.O. Co., E.Whittier Comm.	1-1	34, 2-11		Foundation
	Orange County				
Greenville	P. M. Girard, Mark Fisher	1	27, 5-10	5655	Fishing D.P.
Newport Beach	Signal Oil & Gas Co., Banning	2	20, 6-10	3779	Pumping
	San Bernardino County				
Chino	Chino Hills Oil Co., Kraemer	1	33, 2-28		Location
	Wm. Y. Lee, Corehole	1	21, 2-8	1395	Suspended

Standard Drills Barley Patch

In the Barley Patch area of the Huntington Beach field Standard Oil Co. is completing Huntington B No. 74. Hole was drilled to 3295 ft. and plugged to 3040 ft. after a formation test had shown the lower portion of the Jones sand to be wet.

Standard Develops El Segundo Gas

Near the center of Section 7-3s-14w o nthe north flank of the old El Segundo field Standard Oil Co. is developing the shallow gas sand which is present in this area. During the development of the oil zone several wells were lost by blow outs from this gas sand.

In the late development Standard Oil Co. Gough No. 13 was drilled and cored to a depth of 4308 ft. in gray sand. Hole was plugged to 2990 ft. and 5½ inch casing cemented at 2799 ft. Completed under wraps, the well showed an initial production of 2,050,000 cu. ft. per day of dry gas with pressures held at 1160 lbs. Well is currently flowing in excess of 6,000,000 cu. ft. per day. Gough No. 14, located 150 ft west of the above well, spudded October 24 and at present writing has 5½ inch casing cemented over the middle gas zone at 2200 ft. Total depth is 2310 ft. Open hole tests made indicate a production of about 6,000 mcf.

Norwalk Test Coring Shale

General Petroleum Corp. H. B. Allen No. 1 is coring ahead in Pico Gray sand and shale below 8700 ft. Operator is not giving out any information on the section penetrated but it is rumored that the hole has drilled through the McNally fault. It is reported that the Tide Water Assoc. Oil Co. is blocking up acreage to the west of this well while the General Petroleum Corp. continues to add to its holdings east of the well.

Puente Cat Tests Wet

Horace Steele, Operator Kenwood No. 1 tested wet on the gun perforated interval 3995 ft. to 4055 ft. Well is reported to have flowed fresh water with a trace of oil. Located in Section 17-2s-10w, southeast of the town of Puente, hole was drilled and cored to a depth of 4275 ft. Seven inch casing was cemented at 4272 ft. and perforated for the above test. Well is now standing with perforations squeezed off. Operator reports 2 oil zones, one at 3640 ft. and a second at 3990 ft.

Deep Test Drills at Long Beach

The Texas Co. Fields No. D-1 deep test well in the Long Beach field, is drilling ahead in sand and shale below 8,000 ft. No cores have been taken to date, however an electric log has been run twice. Test is located northwest from the intersection of Spring and California Sts.

Potrero Test Redrilling

Basin Oil Co. Potrero No. 14, section 34-2s-14w, deep test well in the Potrero field, is running whipstock to sidetrack drill pipe fish. Hole was drilled and cored to 9388 ft. where the bottom 1000 ft. of hole was junked.

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San Joaquin Valley

Richfield Rewarded On Tejon Ranch

Richfield Oil Corp. discovered a new producing area in the south end of the San Joaquin valley when Tejon No. 5, located in 35-11n-19w, was completed on pump November 1 for an initial production of 105 bbls. in 21 hrs. of 18.0 gravity oil cutting 6.0% fresh water. The well is shut in at present while operator is building storage tanks. Although a full 24 hr. run has not been made as yet well shows promise of being good for about 150 bbls. per day. Hole was drilled and cored to a total depth of 2372 ft. and bottomed in shale. Approximately 50 ft. of Chanac oil sand was found in the zone from 2158 ft. to 2340 ft. Operator is preparing to drill Tejon No. 6-960 ft. due south of the discovery well.

Discovery Well Goes on Pump

Continental Oil Co. KCL No. G-1 McClung area discovery well in section 4-30s-26e, was placed on the pump October 30 and is at present producing 332 barrels per day of 30.9° gravity clean oil and showing a cut of 38.0% salt water. Located about 2 miles south of the Greeley field, the well was originally completed flowing an initial production of 265 barrels per day cutting 8.3% salt water. Cut steadily increased to over 50%. Well is producing from gun perforations in 5 inch casing between the depths of 7482 ft. and 7501 ft. Operator has rig built for Easton No. 1 northeast of this well in section 33-29s-26e and is drilling ahead below 8000 ft. in KCL No. H-1 on Section 18-30s-26e south of the Strand field.

West Round Mt. Becomes Active

In the area around Bandini Pet. Corp's discovery well, Signal-Mills No. 1, seven projects are currently underway. In Section 24-28s-28e Bandini Pet. Corp. spudded Signal-Mills No. 2 on October 30 and is now drilling ahead below 2000 ft. while foundations have been built for Signal-Mills No. 3. South of these wells, in Section 24, Burton & Benwell abandoned their S. P. L. No. 1 after drilling to 2871 ft. and finding only gray sand in the objective zone.

To the west, in Section 23, General Pet. Corp. Railroad No. 2 is being bailed after sanding up on a brief pumping test. Zone being tested is from 2500 ft. to 2528 ft. North of this well, in section 14, this operator is grading roads for Malta No. 1. To the west, the Texas Co. has location staked for KCL No. 1-13 on section 13-28s-28e. Approximately 3 miles Southeast of this development Wilshire Oil Co. is grading for Hartfield No. 1 on section 32-28s-29e.

Rio Bravo "Cat" Has Ditch Showings

Union Oil Co. Kernco No. 81-8, located in section 8-29s-25e approximately 2 miles southwest of the Rio Bravo field, is spot coring ahead in hard shale below 10,100 ft. Well has had a good showing of oil and gas on the ditch since passing the 9680 ft. level. However a core taken at that depth, and all cores taken since, have recovered only shale. Hole is now more than 500 ft. below the "N" marker over the Stevens zone.

SAN JOAQUIN VALLEY WILDCATS

Area	Well	No.	Section	Depth	Status
	Fresno County				
Coalinga	The Texas Co., S.P.	58-21	21, 19-16	3643	Drilling
	Wilshire Oil Co., Imperial	1	34, 18-15		Location
Huron	Gen. Pet. Corp., Burrel	68-35	35, 16-18	6660	Completed
Jacalitos	Standard Oil Co., Well	67-17E	17, 21-15		Rig
	Standard Oil Co., Wells Fargo	1	30, 21-15		Location
Lanare	Superior Oil Co., Maxfield	41-21	21, 17-18	1015	Drilling
Nicholson	Shell Oil Co., Inc., S.P.	73-35	35, 15-15	655	Drilling
Polvadero	Standard Oil Co., Bourdieu	1A	1, 21-16	9266	Drilling
Raisin City	Pauley, E. W. & H. R., Well	21-29	29, 15-18	4350	Drilling
	Kern County				
Belridge—South	Atlas Prod. Co., Anderson	1	8, 29-21	2125	Abandoned
	C.C.M.O. Co., Temblor	36-1	36, 28-20		Location
Comanche Point	T. W. Burnham, Chiquita	2	34, 12-19	2250	Idle
Cymric	Standard Oil Co., McPhee	37	36, 29-21	6950	Drilling
Edison	Tracy Harkness Seale	2	5, 30-29		Rigging up
	J. Paul Getty, Portals	3	5, 30-29	4021	Completed
	Seaboard Oil Corp., Garrison-Davis	1	30, 29-29		Grading
Elk Hills	Pacific Western and G. F. Getty, Transport	64	26, 30-24	8825	Drilling
Fruitvale	T.W.A. Oil Co., KCL	54-6	6, 29-27	4814	Abandoned
Grapevine	Kern Line Oil Co., Well	1	19, 11-19	9097	Testing
	Richfield Oil Corp., Tejon	5	35, 11n-19w	2372	Completed
	Richfield Oil Co., Tejon	6	35, 11n-19w		Rigging up
Jasmine	Barnhart-Morrow Cons., BMQ	1	15, 25-27	2836	Abandoned
	Western Gulf Oil Co., Well	1	4, 25-27		Location
McClung	Continental Oil Co., KCL	H-1	18, 30-26	7950	Drilling
	Continental Oil Co., Easton	1	33, 29-26		Rig
McKittrick	Terry, George, Well	1	18, 30-22		Location
Midway	C.C.M.O. Co., Well	26	1, 32-22		Rig
Mt. Poso	British-American, Recovery	2	34, 26-28	1309	Completing
	Da-Me Oil Co., Well	3	27, 26-28	1398	Completed
	Da-Me Oil Co., Well	4	27, 26-28	1285	Drilling
	J. T. Wilcox, Zanetti	1	17, 28-28	1555	Drilling
	Vedder, D. G., Well	1-18	18, 27-28		Rigging up
Mt. View	Di Giorgio Fruit Corp., Well	48-10	10, 21-29	1855	Drilling
Poso Creek	Butler Bros. Oil Co., Butler	1	14, 27-27		Rigging up
	Pac. West'n O. Corp., Enas Fee	26A	21, 27-27		Rigging up
	Pac. West'n O. Corp., Enas Fee	38	21, 27-27	2046	Completed
Rio Bravo	Union Oil Co., Kernco	81-8	8, 29-25	10101	Drilling
Round Mt.	Bandini Pet. Corp., Signal Mills	2	24, 28-28	1760	Drilling
	Bender & Benwell, S.P.L.	1	25, 28-28	2871	Abandoned
	Gen. Pet. Corp., Railroad	2	23, 28-28	2785	Drilling
	Gen. Pet. Corp., Malta	1	14, 28-28		Grading
	The Texas Co., KCL	1-13	13, 28-28		Location
	Wilshire Oil Co., Hartfield	1	32, 28-29		Grading
Shafter	T.W.A. Oil Co., Shafter Comm.	86-7	7, 28-25		Rig
Shale Point	Shell Oil Co., Inc., Utting	3	7, 27-19	441	Abandoned
Tehachapi	E. G. Cummings, Poor Boy	1	31, 32-32	1270	Drilling
Temblor	B. F. Delanty, Well	69-A-1	36, 29-20	220	Drilling
Williams	C.C.M.O. Co., Antelope Fee	12-2	12, 28-19	2320	Abandoned
	Kings County				
Hanford	Seaboard Oil Corp., Phillips	66-2	2, 19-22	6535	Drilling
	Madera County				
Herminghaus	The Texas Co., Gill	61-20	20, 13-16		Rigging up
	Shell Oil Co., Inc., Gill	38-18	18, 13-16		Rigging up
Firebaugh	The Texas Co., Moffat	55-7	7, 12-15		Rig
	Tulare County				
Terra Bella	Richfield Oil Corp., Terra Bella	1	29, 22-27	1920	Abandoned
	Richfield Oil Corp., Terra Bella, Comm.	1-1	19, 22-27		Rigging up

General Petroleum Discovers New Field

General Petroleum Corp. has discovered a new producing area with its Burrel No. 68-35 some 300 ft. north and 928 ft east from the south quarter corner of Sec. 35-16s-18e, approximately ½ mile east of the town of Burrel. Hole was drilled and cored to a total depth of 6660 ft. and encountered the first oil sand at 6280 ft. A string of 7 inch casing was cemented at 6541 ft. and gun perforated from 6484 ft. to 6496 ft with 70 half inch holes. With 2½ inch tubing hung at 6469 ft. the well was completed flowing on October 27th. Initial rate was gauged at 342 barrels per day of 31.7 gravity oil cutting 1.0% flowing through a 12/64 inch bean with 580 lbs. tubing pressure and 860 lbs. casing pressure, gas production 151,000 cu. ft. Well is currently flowing at the rate of 324 bbls. per day 32.2 gravity 0.4% cut through a 12/64 inch bean with 750 lbs. tubing pressure and 900 lbs. casing pressure. Gas production is 44,000 cu. ft.

The completion of this well opens up a new field on the Riverdale-Raisin City trend about midway between these two fields. It is doubtful if any other operator will benefit by this discovery as the General Petroleum Corp. controls practically all of the acreage in the area.

Herminghaus Area Gets Two Tests

In the Herminghaus area of Madera County two projects are slated to get underway in the near future. In section 17-13s-16e The Texas Co. is moving in equipment preparatory to drilling Gill No. 61-20 while on section 18 of the township Shell Oil Co., Inc. is rigging up on Gill No. 38-18.

Paloma Field Remains Active

In the Paloma field Western Gulf Oil Co., is currently running 5 strings of tools. In section 33-31s-26e Paloma Unit No. 54-33 is fishing drill pipe with present depth at 10,204 ft. Paloma Unit No. 34-4 in Section 4-32s-26e is coring ahead in gray sand at 10,025 ft. while in Section 2-32s-26e Paloma Unit No. 16-2 is drilling ahead after cementing 13⅜ inch surface casing at 1254 ft. Paloma Unit No. 58-3 is drilling ahead in hard shale below 7200 ft on Section 3-32s-26e while Symons No. 31-7, in Section 7-32s-27e, is drilling in hard shale below 8300 ft. In addition to these, operator is rigging up on Paloma Unit No. 34-12 in Section 12-32s-26e and has foundation poured for Paloma Unit No. 47-2 and 78-2 in Section 2-32s-26e.

Southerly Greeley Outpost Testing

Standard Oil Co. Wegis Comm. No. 1, southeasterly outpost well in Greeley field, is running a liner after an open hole test showed the well to be capable of 800 barrels per day production. Located in section 21-29s-26e hole was drilled and cored to a total depth of 11,600 ft. and found the top of the Vedder sand at 11,475 ft. Seven inch casing was cemented at 11,445 ft. over the top of the good producing zone.

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Fig. 2 shows Full Circle Interlocking Slips and Setting Pin in set position. Slips assure complete contact all around in casing wall. Prevents heave around outside of Hanger.

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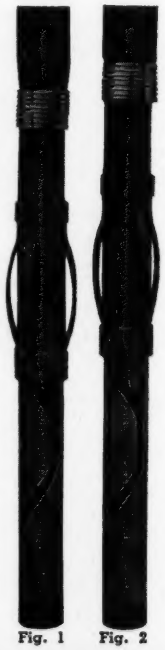

Fig. 1 Fig. 2

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Coastal and Northern Districts

Contra Costa Co. "Cat" Shows Gas

In the Pittsburg area of Contra Costa County Cal-Bay Corp. Faria No. 1 blew dry gas at a 125,000 cu. ft. per day rate. Located in Sec. 21-2n-1w the hole was drilled to 4398 ft. and 7 inch casing cemented at 4343 ft. Gun perforations open on the test were from 4269 ft. to 4289 ft. Well is now standing idle while negotiations are under way for an intended deepening job.

Colusa County Test Coring High

General Pet. Corp. is coring ahead at 1530 ft. in Capital No. 1. Located i nSec. 15-16n-1w, the hole was spudded on October 27 and 9⅝ inch surface pipe cemented at 484 ft. Coring operations were started at 1300 ft. All cores taken to date have recovered only gray sand and siltstone.

Chico Test Continues

In the Chico area of Glenn County Superior Oil Co. is drilling ahead in shale below 8700 ft. in Glenn Comm. Three No. 72-20 on sec. 31-21n-1w. Operator considers this a no dope hole and has released no information on the section penetrated to date. It is known however that several formation tests have been made none of which showed any indications that a producing well could be expected at this location.

Monterey Cat Getting Deep

Royalty Service Corp. continues to prospect ahead in its Federal No. 1. Well is currently being drilled and taking spot cores of hard brown Miocene shale below 6900 ft. The sandy section of the Miocene has not been encountered to the present depth. Hole is located in Section 21- 24s-10e on the Pleyto anticline, approximately 5 miles southwest from the town of Bradley.

Amerada Testing

Amerada Pet. Corp. Gwerder No. 1 drilled and cored to a total depth of 3799 ft. and is now running a formation tester after plugging back to 3385 ft. No information is available as yet as to the zone being tested. Hole is located in the Thornton area of Sacramento county on Sec. 36-5n-5e. It is reliably reported that the company is planning to drill another well in this area. Location will probably be on the Goldman property in Section 32 of the same Township and Range.

Tehama County Gets New Test

In the Paskenta area of Tehama County Petrol Producers and Refiners Corp. have staked location for Donna No. 1. This will be this operator's initial venture in the drilling and producing end of the oil game.

They have, however, operated a small refinery for several years in the northern part of the state. Well will go down on section 6-23n-6w.

Suisun Tests Getting Deep

In the Suisun Bay area of Solano County Standard Oil Company's two exploratory wells have reached the deep test class. Honker Comm. No. 1-A has drilled to 8304 ft. in shale and is currently fishing for drill pipe which is stuck at 7502 ft. while A. O. Stewart No. 1 is drilling ahead in shale with streaks of sand below 7100 ft. Both wells are located on Sec. 25-3n-1w.

Los Nietos Co. Fishing Slips

Los Nietos Co. Scott No. 1 is fishing for drill pipe slips which were dropped in the hole. Present depth is 2595 ft. in sandy Sisquoc shale, hole is located on Sec. 5-32s-13e in the Edna area of San Luis Obispo County.

COASTAL COUNTIES WILDCATS

Area	Well	No.	Section	Depth	Status
Capitan	C. M. Morse, Rhode Island	1	2, 4-30	537	Abandoned
Casmalia	O. C. Field Gas. Corp., Casmite	3	13, 9-35	209	Drilling
Lompoc	Fickert Oil Co., Ltd., Fickert	1	8, 7-33	800	Idle
Los Olivos	Hub Oil Co., La Laguna	1	7, 7-30	3580	Idle
Purisima Hills	Whittier Assoc., Barham	1	11, 7-32	4847	Plugging
Sisquoc	J. I. Anderson, Elliott	1	6, 9-32		Foundation
	Ventura County				
Bardsdale	San Marino Oil Co., Elkins	1	7, 3-19	561	Drilling
Camarillo	Camarillo Oil Co., Camarillo	2	32, 2-20	1836	Bailing
Del Valle	Herley-Kelley, Black	1	13, 4-18		Grade
Eureka Canyon	El Rika Oil Co., Well	6	33, 4-18	386	Pumping
Fillmore	Standard O. Co., Fillmore Comm.	2-1	24, 4-20	10268	Drilling
Happy Camp	Cal Camp Oil Corp., Harrington	1	21, 3-19		Location
Ojai	Richfield Oil Corp., Ojai	48	12, 4-22	1152	Idle
Oxnard	Edward F. Delaney, Todd	1	6, 1-21	2005	Drilling
	Exeter Oil Co., Ltd., Lennox	2	6, 1-21	452	Drilling
	Hub City Pet. Co., Chase	1	6, 1-21	1429	Drilling
Piru	Pac. West. Oil Corp., Temescal	17	4, 4-18	1307	Drilling
	Standard Oil Co., Crestmont	1	14, 4-18	7375	Pumping
Santa Paula	J. J. Stevens, Corehole	1	31, 4-20	1500	Cleaning out
Sespe	Merchants Pet. Co., Cochrane	7	1, 4-20	1235	Drilling
	Volunteer Pet. Co., Tar Creek	3	28, 5-19	1306	Cleaning out
Simi	Mayo Oil Co., Montgomery	1	16, 2-18	106	Drilling
South Mt.	F. E. Fairfield, S. M.	1	19, 3-20	4449	Drilling
Torrey Canyon	Union Oil Co., Torrey	60	5, 3-18	6146	Idle
Wiley Canyon	Wilshire Oil Co., Ventura Realty	1	1, 3-19		Rig

NORTHERN COUNTIES WILDCATS

County	Well	No.	Section	Depth	Status
Butte	Richfield Oil Corp., Chico	1	17, 21n-1e	6500	Reaming
Colusa	Gen. Pet. Corp., Capital	1	15, 16n-1w	1530	Drilling
Contra Costa	Cal-Bay Corp., Faria	1	21, 2n-1w	4398	Idle
	Standard Oil Co., Oursan Comm.	1	28, 2n-3w	1728	Drilling
Glenn	Richfield Oil Corp., Afton Comm.	1	2, 18n-1w		Cellar
	Superior Oil Co., Glenn Comm.	72-20	31, 21n-1w	8690	Drilling
Monterey	Royalty Service Corp., Federal	1	21, 24s-10e	6898	Drilling
Sacramento	Amerada Pet. Corp., Goodfellow	1	25, 5n-5e	3772	Completed
	Amerada Pet. Corp., Gwerder	1	36, 5n-5e	3799	Testing
San Joaquin	Richfield Oil Corp., East Stockton	1	5, 1n-8e	985	Drilling
	Standard Oil Co., Fairoaks Comm.	1	19, 1n-7e		Rigging up
	Standard Oil Co., No. Roberts Isl.	1	36, 1n-5e	5262	Abandoned
San Luis Obispo	Los Nietos Co., Scott	1	5, 31s-13e	2595	Fishing slips
Solano	Standard Oil Co., Honker Comm.	1A	25, 3n-1w	8304	Fishing D.P.
	Standard Oil Co., A. O. Stewart	1	25, 3n-1w	7040	Drilling
	Standard Oil Co., Suisun Comm.	3	5, 3n-1w		Location
Sutter	Shell Oil Co., Buttes Comm.	C-1	12, 16n-1e	4552	Drilling
Tehama	Petrol Prod. & Ref. Corp., Donna	1	6, 23n-6w		Location
Yolo	Empire O. & G. Corp., Porterfield	1	18, 10n-2w		Location

Oxnard Area Again Active

East of the town of Oxnard, on section 6-1n-21w, three projects are currently underway. Edward F. Delaney Todd No. 1 is drilling ahead below 2000 ft., Exeter Oil Co. Lennox No. 2 is drilling below 500 ft. and Hub City Pet. Co. Chase No. 1 is drilling in sand and shale at 1429 ft. These wells are located in the area where two asphalt wells have been pumping for several years.

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Purisima Cat Pumps Water

In the Purisima Hills area of Santa Barbara County, Whittier Associates Barham No. 1 is standing plugged after pumping at a maximum rate of 60 barrels per day of oil and 1150 barrels of water. Located in section 11-7n-32w, the hole was drilled and cored to 4847 ft. in gray sand. Hole was plugged to 3362 ft. and a combination string of 7 inch casing landed at 3333 ft. and cemented through perforations at 2632 ft.

Fillmore Test Getting Deep

Standard Oil Co. Fillmore Comm. No. 2-1, located in section 24-4n-20w, northwest of the town of Fillmore is drilling ahead below 10,300 ft. and taking spot cores at 150 ft. intervals. All data on the section penetrated is being withheld by the operator.

Holser Canyon Cat Completed

Approximately 3500 ft. easterly from Continental Oil Co's. discovery well, Holser No. 1, Standard Oil Co. has completed its Crestmont No. 1. Hole was drilled to 7375 ft. and plugged back to 6200 ft. and a combination string of 7 inch casing was landed at 6198 ft. and cemented through perforations at 6018 ft. On pump, the well produced fresh water with a trace of oil for several days before attaining the present production of 80 barrels net per day of 27.6 gravity oil cutting 76% fresh water.

Richfield Spuds East Stockton Well

Richfield Oil Corp. East Stockton No. 1 spudded November first and is now drilling ahead below 1000 ft. after cementing 11¾ inch surface casing at 504 ft. Test is located in Section 5-1n-8e northeast from the town of Stockton.

Polvadero Test Getting Deep

Standard Oil Co. Bourdieu No.1-A in Sec. 1-21s-16e is drilling ahead in hard shale (Kreyenhagen?) below 9300 ft. Located about 2 miles North of North end of the Kettleman Hills North Dome field the well has for it's objective the Eocene-McAdams sand which should be encountered at about 10,500 ft.

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Fruitvale Cat Now Abandoned

Tidewater Assoc. Oil Co. KCL No. 54-6 was abandoned in gray sand at a depth of 4814 ft. Located in section 6-29s-27e, approximately 3 miles northwest of the Fruitvale field, the well found all sands in the Chanac to be wet.

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